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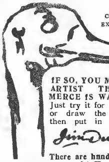

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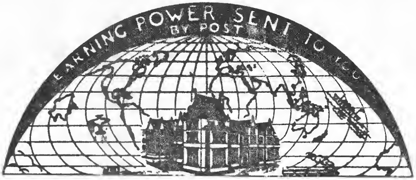

OPEN LETTER TO MR. SOMEBODY AND HIS SON

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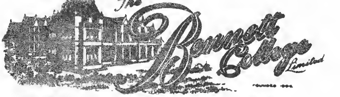

Dept. 17, THE BENNETT COLLEGE, SHEFFIELD.

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SMOKE RINGS

The "Dyak" Competition.

JUDGING from some correspondence I have received during the past few days, there seems to be some misconception in the minds of "Dyak" builders as to their position as regards entering their models for our forthcoming Exhibition. In his notes this week, "L.B.S.C." explains the position in regard to his own special Competition, and we have added thereto some lines in regard to the entering of models as loan exhibits at our Exhibition. We should like to make it quite clear, however, that those who wish to do so can enter a "Dyak" in our official No. 1 Competition at the Exhibition, in which case their entry will be judged on the usual basis in relation to the other locomotives exhibited. Models so entered will be eligible for consideration for any awards from our official prize list to which their merit may entitle them, but no steam tests will be made, and they will not be considered by us in connection with the special list of prizes offered in "L.B.S.C.'s" own Competition. The arrangements for judging that Competition will be made separately, at a later date, by "L.B.S.C.," and any "Dyak" builders who desire to compete in that special event must notify "L.B.S.C." accordingly. "Dyak" locomotives shown at our Exhibition will not be precluded from entry for "L.B.S.C.'s" Competition, and those who prefer not to put their models into our Competition may show them in our Loan Section if they wish to do so. It is, however, not necessary to send a "Dyak" to our Exhibition if the builder wishes to enter it only for the Competition organised by "L.B.S.C." We have already received several "Dyak" entries for our own Competition, and I would remind those builders who still wish to enter, that they should procure and return their entry forms not later than August 24th.

* * *

More Exhibition Prizes.

I AM pleased to record two further additions to the prize list for the forthcoming "M.E." Exhibition. Mr. F. E. Hills kindly offers a special prize of £1 1s. for the best example of miniature ship modelling, either steam or sail, to a scale of 40 ft. to the inch, or smaller. The V.S.P. Engineering Co., desiring to extend recognition to workers with a limited kit of tools, kindly offer one of their three-inch bench lathes, with accessories, as a special prize for the best model made without a lathe, the award to be made at the discretion of the judges in appreciation of a meritorious piece of work.

* * *

The Last Day for Exhibition Entries.

I AM writing a final reminder to those who have not yet obtained or returned their entries for our Competitions, that the last day for sending in forms is August 24th. The actual models themselves, if delivered by hand, are not required till the day before the Exhibition opens; if they are sent by rail or other carrier they should be dispatched so as to arrive at the Hall between September 14th and 16th. Full instructions will be posted to all competitors in good time for the dispatch of their models.

* * *

A Society for Brighton.

THERE must be many model engineers in the Brighton and Hove District who would enjoy meeting together in a friendly way. Mr. C. Wilkins of Lower Flat, 406, Ditchling Road, Brighton, is desirous of forming a Society, and would be glad to hear from all who would be willing to attend a preliminary meeting.

Some Canadian "Live Steamers" in Montreal (F. G. Jerome; H. Gerrie; D. W. Massie; M. Massie.)

A Canadian Visitor.

AMONG the Canadian ex-Service men who recently came over to attend the unveiling of the Vimy Memorial by King Edward, was Mr. A. W. Leggett, of St. Lambert, Montreal. On his return through London he paid me a welcome visit, and I spent a very pleasant hour or so looking at a fine selection of model locomotive photographs, and hearing about the doings of the "Live Steam" Society, which is very much alive in Canada and the North-Eastern portion of the United States. Mr. Leggett spoke in glowing terms of the good fellowship which exists among the members of this body, and of their enthusiasm for steam locomotives in miniature. The territory covered by their membership is very extensive, and at their annual rally at Marblehead, many of the members who come with their locomotives travel several hundred miles to put in an appearance and share in the day's enjoyment. Mr. C. A. Purinton is the presiding host on these occasions and inspires everybody with his own cheerful enthusiasm for "live steam." This organisation manages to preserve a continuity of effective existence, without any rules, and almost without any officials. The subscription is the modest sum of 25 cents. Individual members meet and correspond, and once a year there is the "grand rally" at Marblehead, a function which has already been described in the pages of the "M.E." Mr. Leggett showed me a photo of his own fine $3\frac{1}{2}''$ Gauge Model Canadian "Pacific" 4—6—2 engine, which has hauled on the track a passenger load of over 1,460 ...

with such an elaborate job as an initial effort, he laughingly replied: "Well, I quit five times!" Anyway, patience and perseverance saw the engine completed at last, and Mr. Leggett has had many happy hours running it on his garden track at St. Lambert. He was very interested in the drawings of the "Midge" which I showed him, and as he has ideas of a more extensive running track in the near future, it is possible that a "Midge" may become a centre of attraction for Canadian "Live Steamers." Mr. Leggett spoke to me about the activities of a number of his "live steam" friends, including Mr. F. G. Jerome, Mr. H. Gerrie, and Mr. D. W. Massie, and he referred to their appreciation of the "M.E." and the spirit of brotherhood which runs through its pages. Mr. and Mrs. Leggett were both deeply impressed with the Vimy ceremony, and the reception extended to the Canadian pilgrims at Buckingham Palace; they will carry back some very happy memories of their visit to this side of the Atlantic. Mrs. Leggett is almost as keen a model engineer as her husband. I shall expect her one day to send me a photograph of her first attempt at model locomotive building.

* * *

Exhibition Posters.

A VERY attractive poster for this year's Exhibition will be ready in a few days. We shall be pleased to send copies to any reader who can kindly arrange for a suitable display.

MODEL MARINE NOTES

A Model of H.M.S. "Amazon"

MODEL MARINE NOTES

A Model of H.M.S. "Amazon" with Flash Steam Plant.

By W.F.W.

THE real reason for starting to build this model was an old flash steam plant which had long lain idle. I had it out one day to see if it would still work, and was so pleasantly surprised when it did, that I made the rash decision to give it something to drive in the shape of a model destroyer. It will come as no sort of shock to boat builders when I mention that, of this plant, only the original pump and sundry fittings form part of the finished article, but that is how it started.

Having no particular vessel in mind, I first looked through Oscar Parkes' "Ships of the Royal Navy" in search of a suitable ship to model. I had decided to use only one working funnel, and expecting there might be trouble in coaxing the gases from a blowlamp up a scale funnel, looked out for a ship with a good-sized forward funnel. The ships *Amazon* and *Ambuscade* seemed suitable in this and other respects, and of these, I chose the former as having the greater displacement. The dimensions given were :—

$311\frac{3}{4} \times 31\frac{1}{2} \times 9$ feet = 1,352 tons.

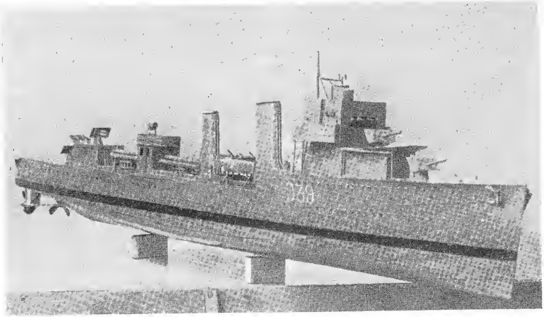
Scaled down 1/66 full size, this gave :—

$55.6 \times 5.73 \times 1.64$ inches = 10.53 lbs.

As far as I could judge from the illustration, the freeboard amidships would be 1.8 inches. This I decided to increase to 2 inches to make her more seaworthy, and the draught to 1.75 inches to allow me a little more weight to play with, and to these overall dimensions I drew the lines.

Having got the lines of the hull to my liking, the details above deck level were added to the drawing, scaling up from a postcard size photo. A slide rule saved a lot of time here.

The building board was two pieces of pitch-pine accurately planed, and used as shown in photo., with a piece of plywood, bent to give the necessary sheer, screwed to the forecastle part. The deck plan was drawn on the board and a gunwale of $\frac{1}{8}'' \times \frac{1}{2}''$ angle tin fastened to the board with drawing pins. (The gunwale and plating is of .0085″ tinplate, ribs and bulkheads of .017″ tinplate).



Bow view of model of H.M.S. "Amazon."

On this the ribs were erected at two-inch intervals, making a sort of "toast rack." The ribs were made of strips of tin $\frac{1}{4}''$ wide bent to $\frac{1}{8}'' \times \frac{1}{8}''$ angle. By careful bending-cum-hammering, these L girders were formed to the shape of the cross sections on the drawing. There is no keel.

Pieces of stiff paper were used as templates for the plates. Thirty-five plates were used. Of these, the four under the bilge keels were made of copper, as I intended to condense steam in the bilge keels, which are hollow for this purpose. Also, the two top plates in the bow are copper, and these had to be several

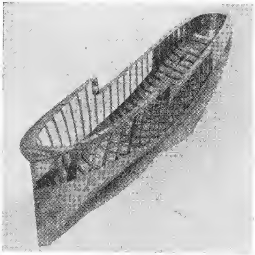
times annealed whilst being rubbed to shape. Some of the tin plates had, also, to be rubbed to the necessary shape before fitting.

The next job was to solder on 154 rings cut from brass tube to represent portholes.

Up to now $5\frac{1}{4}$ ozs. of solder had been used, and the bare hull with tubes and A brackets for propeller shafts, weighed 2 lbs. 15 ozs.

The boat was then floated with machinery in position, and weights added to represent deck, etc. She floated true to the waterline aft, but $\frac{1}{2}''$ high forward, which meant that the water tank would have to go in the forecastle.

I decided to make a watertight compartment of the first 20″ of the hull, so rib No. 10 was removed and a bulkhead fitted in its place. A hole was first cut in the bulkhead, and the top rim cut from a Lyle's syrup tin soldered on.



Hull partly plated.

Into this the lid of the tin fits, making a good watertight door. This lid also forms the after end of the water tank, which is thus situated under the forecastle.

Two low bulkheads aft, 2″ apart, form the sides of the gear box. The propeller shafts are parallel, at 3″ centres. On each is mounted a 2″ gear wheel. One meshes with a 1″ wheel driven by the engine, and the other is driven through an intermediate 1″ wheel.

The difficulty of locating the bushes which carry gear and propeller shafts in the gear box was overcome by holding the shafts in position by an accurately drilled wood block whilst the bushes on the shafts were soldered into slightly oversize holes drilled in approximately correct positions in the gear box walls.

The gears are Bond's, of brass, and run in oil.

The forecastle deck was now added, also the bridge, and other parts that rest on it, and the hull washed out with petrol to clean off "Fluxite," and then enamelled.

Inside the watertight compartment was not enamelled, but thoroughly coated with thick cylinder oil, applied warm. I preferred this to painting, as I thought there was a possibility of paint chipping off in some inaccessible place, and rust setting in.

This done, I indulged in a steam trial. Needless to say, almost incredible self-restaint had to be exerted to avoid trying the plant before the hull was painted and ready for it. By a stroke of luck, everything went well on this test, and I got busy and finished the main deck, which was simply a piece of rather tedious plumbing.

Now, the plant around which the boat was built had a single cylinder s.a. uniflow, which needed 60 to 100 lbs./sq. in. to do itself justice, and about 30 lbs. to give its initial kick, and was always rather loath to start. Further, tank tests also revealed the fact that cold cylinder oil was going to clog the pump suction, and make the pump unreliable.

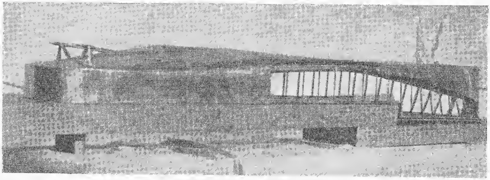
That being so, the idea of condensing was very reluctantly scrapped (and with it all hope of keeping to designed displacement), a larger water tank fitted holding 2 lbs., and the present plant put together with the following objects in view :—

It should (1) Be easy to start. (2) Have a silent burner that could be heated up in position.

Engine.

The engine is a Stuart "Star." It is not held by the lugs provided, but by lugs silver-soldered to the steel tubular frame which also holds the pump and worm steel shaft. The after ends of this frame fit on to two screw heads attached to the gearbox. The front ends are flattened and drilled $\frac{1}{8}''$, and slide on to pins projecting from brackets on the bottom of the boat. The whole plant can be slid forward and lifted out after removing a milled nut from one of the pins.

One or two additions have been made to the engine. A piece of steel tube was accurately drilled and turned to fit on crankshaft, and carry

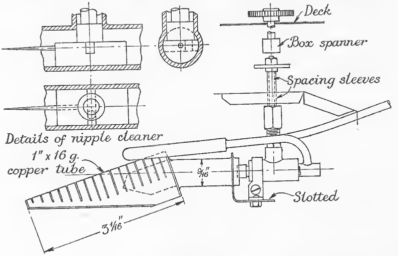


Hull on building board during plating.

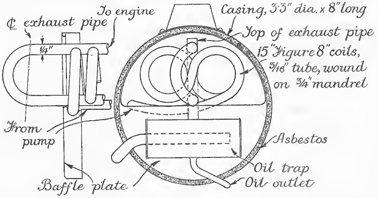
the worm and fan. The sketch shows how this is supported, the casing to hold oil for worm, and the extra flange by which it is attached to the engine.

A *U* shaped $\frac{1}{4}''$ tube was screwed into the bottom of the crankcase to release water from it, and as the screws which held the valve bevel gears worked loose after a time, taper pins were fitted to prevent any more bother from that cause.

It is often convenient, especially when launching the boat from a moving dinghy, to start up the engine with the boat out of water, and to enable this to be done without racing the engine, I fitted a screw-down stop valve to bypass steam from steam chest to exhaust. The "Star" is, of course, a very sweet running little engine, and will tick over light with scarcely any pressure showing on the gauge, so that this valve enables steam pressure to be reduced to any extent without interfering with the flow of water through the boiler.



Petrol Burner.



Smoke box of boiler, showing present arrangement of coils.

In starting, I open the bypass, wait till the boiler is fairly warm, and use the hand pump. As there is practically no pressure, the valve box is readily freed of any air which may have got in the pipes, and steam passing through steam chest heats the engine. Bypass is closed for a moment while starting engine, and then re-opened till it is just comfortably ticking over. The deck can then be placed in position and the boat launched. Then, on closing bypass and increasing flame, the engine at once runs up to full speed.

Pump.

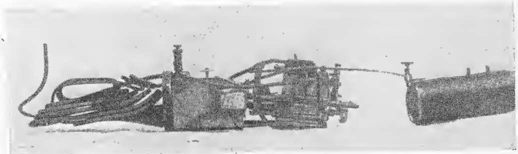
This is 9/32″ bore × variable stroke, secured to frame by two aluminium clamps. Smaller bore would have been better, allowing for finer adjustment of water. Valves are $\frac{1}{4}''$ R.S. balls with lift restricted to about 1/32″. Hand pump has 3/16″ bore barrel joined to the common valve box by $\frac{1}{8}''$ pipe, and is shut off by a plug cock on the valve box when not in use. The pump is driven by worm gear, giving $12\frac{1}{2}$ to 1 reduction.

I have measured the water pumped and total revs. over tests of 15 to 20 minutes each, and the pump efficiency has worked out at 66, 69 and 71 per cent.

There is no water bypass. Stroke used for pressures up to 30 lbs./sq. in. is .25, giving displacement ratio of 309/1.

Boiler.

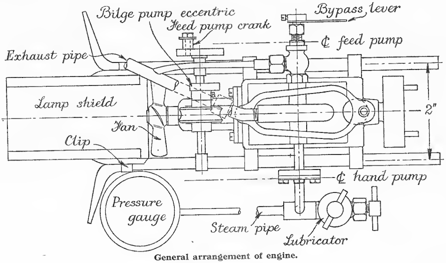
The sketch shows the present boiler, which is 9 ft. of 3/16″ and about 15 inches of $\frac{1}{4}''$ copper tube. It was easily bent to shape in the



Steam plant with boiler casing removed to show first boiler.

condition it came from J. Heath's, i.e., without further annealing. Casing is a cylinder of thinnest tin, lined with thin asbestos bought as a stove mat. The ends are tin lids, part of the lamp end being cut away and the lamp shield riveted to it.

mixing tube. Petrol tank is $5\frac{1}{2}'' \times 2\frac{1}{2}'' \times 1/64''$ copper, silver soldered. Valve and filler are Schrader valves from old car tubes. The one used as a filler is bored out somewhat, and the ordinary cap used as stopper. They are perfectly tight, the only snag about them is



General arrangement of engine.

The boiler shown in the photo was wound to accommodate a radiating element from a gas fire. This addition was not successful, the boiler steaming much better without it. The, burner, which may show in the photo, was similar to the present one, but had a thin steel slotted tube and too short a mixing tube, and occasionally lit back, so was replaced by the present one shown in sketch.

Lamp.

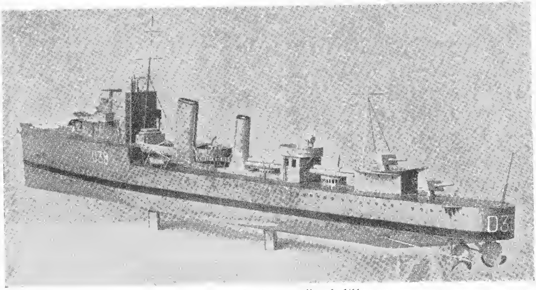
This is "L.B.S.C.'s" slotted tube pattern, modified to suit the first boiler. It burns almost silently—only a very faint hiss. It is warmed by a little methylated spirit put in the bottom of the lamp shield, and when petrol is turned on, starts without ever lighting back through the that valve and cap must be removed when not in use, to prevent the petrol vapour perishing the rubber in them.

Lubricator.

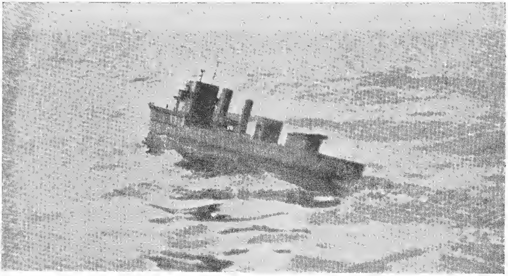
The displacement lubricator supplied with the engine is used, and proved quite satisfactory till one day, when trying a powerful burner with too little water, the lead packing melted and blew out. Normally the steam is nowhere near hot enough to melt lead, but to prevent being put out of action again in that way, the remainder of the lead was scraped out of the groove and a little silver-solder run in instead.

Oil Trap.

When starting from cold, water and oil spraying up the funnel proved a nuisance, so



Model of H.M.S. "Amazon," scale 1/66.



Start of a trial run.

I fitted the crude trap shown in sketch of boiler. It has not long been in use, but seems to serve the purpose. The $\frac{1}{4}''$ exhaust pipe is left full bore, and has not much blast effect, hence the fan, a necessity in the old condenser plant, was retained.

A fitting that adds to the interest of running the boat (and incidentally enabled the pump efficiency to be worked out) is a "Veeder" rev. counter, bicycle type. A 40 tooth clock wheel is soldered to it, and it is driven from the starboard propeller shaft, the gearing being so proportioned that 100 revs. of engine register one unit on the counter. This is convenient for timing the engine speed.

I find a small "Wesco" plunger-operated oil can quite the best thing for filling the lubricator with thick oil, and putting it in other places where it is wanted, quickly and without waste.

The main deck is in two parts, both quickly removed when necessary, the break being just in front of the after funnel. I originally intended to make it of plywood, but changed to tin to avoid buckling by heat and damp. The "deck fittings" are as few and simple as possible, the finish aimed at being something that would look fairly lifelike under working conditions and yet be easy to keep clean. Nothing was added that could reasonably be omitted, but care was taken that what was put in was, as far as I could judge, of the right overall dimensions, and in the right place. I am afraid I have little patience for making fittings, and it may amuse readers to know that I soldered little wood screws where the fittings had to go, and for many months they remained unadorned. Eventually they were added, at such long intervals that since Mr. Davies speaks of a year as being a long time for building a model, I am ashamed to say when I started mine !

I am also ashamed to say that although I started with the idea of keeping the weight down to 11 lbs., the finished weight, light, is nearly 12, to which must be added that of water and $3\frac{1}{2}$ ozs. of fuel. Hull and decks weigh 7 lbs. Steam plant 4 lbs. 14 ozs. However, she only floats 3/16″ below her proper water line when fully loaded, and well above it when light, so I do not worry unduly.

As it is more convenient for me to run the boat on the sea than a lake, it is good to know that the water-tight compartment will keep her bow 6 or 8 inches out of water, should she become waterlogged, Actually, however, very little water gets aboard, although she often runs in fairly choppy seas, and on her trials was lifting her bows clear of the water as far back as the bridge.

If I were building another destroyer, I would make the hull of wood and the decks only of tinplate. I would also have smaller gears, and no reduction between engine and propellers. The reduction gear was fitted so that a small high speed engine could drive scale size propellers, and puts the present engine at a disadvantage. I regret I cannot give the boat's speed, as she has never been timed. Probably 3 to 4 m.p.h. is about the mark. but with his 1/72 scale boat, I think Mr. Davies should have no difficulty at all in getting 5 m.p.h., with a similar plant and 1 to 1 gear.

New Uses for Asbestos.

The value of asbestos as a fire-resisting material has been turned to a new purpose by Bells Asbestos and Engineering Supplies, Ltd., of Slough. As the result of a discovery by a Lancashire textile research chemist, asbestos can now be coloured and "finished" in a manner which enables it to rank as a textile material, in the many and varied directions in which it will now serve, equally with other textiles such as linen, cotton and wool.

Some of the applications of the material in its new form are asbestos window curtains, gloves for handling hot objects, aprons, motor suits for racing-car drivers, fire-fighting suits, and "fire-stops" or heavy drop curtains for theatres or other large buildings where the interposition of such a curtain would isolate an outbreak of fire.

A Model Condensing Beam Engine.

Designed and Built by Harold Thornton.

Specification :—Stroke $3\frac{1}{2}''$; Bore $1\frac{3}{4}''$; Steam Pressure, 60-80 lbs. per square inch.; Steam Cut Off, approx. .625 of stroke.

Case and Foundation Frame.

The engine baseplate is mounted on a strongly constructed wood foundation frame lined on the outside with oak. The flywheel race is formed in the back of this frame whilst the centre and front portion houses the condensing plant, boiler feed pump, steam trap, discharge water receiver, and all pipe connections. At each end of the frame "invisible lighting" is provided.

A removable case built of oak, with glass front and ends, and with "invisible lighting" in the roof, fits over the entire engine and baseplate and rests on the foundation frame to which it is registered and secured with four metal-thread brass screws. The ends and back of the case are lined with mahogany strips for a height of approx. 4".

All pipe connections for steam supply, injection water, condenser priming water, feed water to boiler, and discharge water are taken through the back of the foundation frame and are ready to receive unions or other connections as desired. A two-pin plug is fixed on the outside back of the frame to supply current for the electric lamps which are 230 volts.

Base Plate, Columns, and Beam Frame.

The baseplate is cast in aluminium and all facings on both the top and underside are machined. It is also machined underneath where it fits on the foundation frame to which it is secured with eight steel bolts and nuts.

The four end columns and the centre column carrying the beam frame are of cast iron, machined on both bases and caps, and secured with steel studs and dowel pins. The centre column also carries a cast iron block, to which are secured the beam bearings, the ends of this block being also bolted to the beam frame.

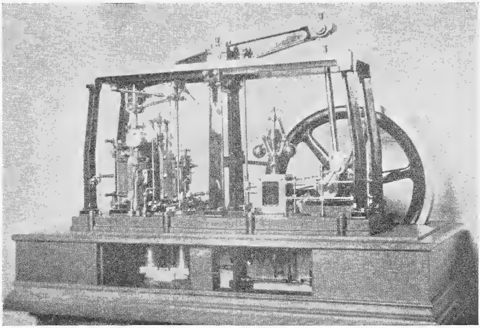
The beam frame is of aluminium polished on the face and edges, and bolted and dowelled to the columns.

Cylinder, Steam-Chest, Slide Valve, etc.

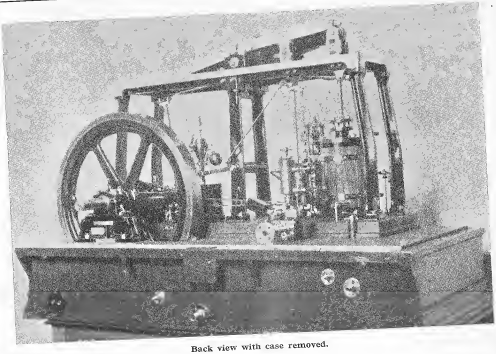
The cylinder and steam-chest are in one casting of cast iron. Cylinder is lagged with pitch pine and two polished brass bands. Drain cocks and spring relief valves are provided at each end of the cylinder and a drain-cock is fitted to the bottom of the steam-chest. These drains are all piped to the discharge water receiver. Steam ports are all cored in the casting and the cylinder is bolted and dowelled to the baseplate.

The covers are all of cast iron, polished, and each secured with six steel studs and nuts. Glands and valve rod stuffing box are of gun-metal, polished.

The piston is of cast iron fitted with two gun-metal rings, ring carrier, and retaining ring.



Front view with case and panel door removed.



Back view with case removed.

The piston rod is of silver steel, bottom end being screwed into piston and secured with a lock nut, whilst the top end is coned into the crosshead and secured with a castle nut and pin.

Slide valve is of gun-metal working between machined guides on each side and on back. Valve rod is of silver steel with a tail bearing at bottom end working in a gun-metal housing. Top end of rod is adjustable in a polished steel crosshead by means of two nuts, valve motion is provided by a rocking shaft carried in three gun-metal bearings bolted and dowelled to baseplate and carrying gun-metal levers, each secured with two taper pins. Valve side rods are of silver steel with gun-metal bearings top and bottom, the top ones being adjustable for length of rod. A third lever is mounted on the rocking shaft and operated by the eccentric rod. A cast iron balance weight is fitted.

Piston Rod Straps, Pump Rod Straps and Parallel Motion.

The straps are of mild steel machined from the solid, polished all over and fitted with gun-metal bearings in halves, taper cotters, gibs, and distance blocks. The taper cotters are secured with steel set screws and split pins.

The parallel motion consists of two inner radius-rods of silver steel from the piston-rod crosshead to the bottom crosshead of pump-rod straps, and two outer radius-rods of silver steel from bottom crosshead of pump-rod straps to gun-metal brackets carried on the beam frame. Gun-metal bearings at each end. Outer radius-rods are adjustable for length by means of right and left hand threads.

The pump-rod straps carry a second cross-head to which the pump-rod is attached.

Beam.

Of cast iron and fitted with three steel gudgeon-pins forced into accurately machined holes. The gudgeon-pin for the connecting rod is removable, one end being screwed into one side of the beam and secured with a lock nut whilst the other end is held with a cone and conical bush.

Beam Bearings.

Of malleable iron fitted with gun-metal brasses in halves, caps, nuts and lock-nuts. The bearings are secured to a cast iron block as previously mentioned.

Connecting Rod.

Of malleable iron, turned taper and polished all over. Solid ends top and bottom fitted with gun-metal bearings in halves and adjustable by means of taper wedges, screws, and lock-nuts.

Crank and Crank-Shaft.

Crank-shaft is of steel turned all over. Key-ways machine cut. Shaft extended through back of case to carry driving pulley or similar.

Crank is of malleable iron machined and polished on face and edges.

Crank-pin of steel fitted with registered outer collar flange secured with steel set screws. This flange carries the banjo oiler.

Crank-shaft bearings of cast iron fitted with gun-metal brasses in halves, caps, nuts and lock-nuts.

Hand-railing is provided round the crank and consists of turned steel pillars and silver-steel rods.

Flywheel.

Is of cast iron, $13\frac{1}{2}''$ diam. and weighing about 20 lbs. Six elliptical arms. Wheel is polished on face and edges of rim.

Eccentric and Straps.

Eccentric is of cast iron bored to shaft and registered and bolted to a polished cast iron disc which is keyed to the crank-shaft. This disc also carries a sprocket-wheel for driving the governor.

Eccentric straps are of gun-metal, in halves, and registered to the eccentric. Secured together with steel studs, nuts and lock-nuts.

Eccentric-rod is of steel, lattice pattern cut from the solid, and is recessed into the eccentric strap and held with two steel bolts and nuts. The other end is provided with a gun-metal bearing actuating the rocking shaft already dealt with.

Governor.

Is of the medium speed centre weight type with a gun-metal sleeve, fork, and lever which is connected through silver-steel rods and another gun-metal lever to the throttle-valve. Provision is made for adjusting the engine speed. Governor spindle is of silver-steel mounted in an aluminium box with front cover which houses a pair of gun-metal mitre wheels. The balls are of cast iron, turned and polished, and the arms of steel, polished. The governor is driven from the crank-shaft by means of a " Renold " chain.

Condensing Plant.

This consists of a jet condenser, foot valve chamber, and pump barrel with hot well, each of aluminium.

The condenser is fitted with a gun-metal jet ring having 16 jets. A vacuum-gauge is provided and mounted near the engine cylinder and connected to the condenser. The injcction water pipe is fitted with a control valve with extension spindle to top side of baseplate. A priming water-pipe (in case of emergency) with cock is fitted, the latter also having an cxtension spindle to top side of baseplate.

The foot valve and its seat are both of gun-metal and are of the inclined swing type. Covers both above and below the foot valve are fitted.

The pump bucket is of gun-metal with water grooves and carries a gun-metal mushroom guide and rubber valve, whilst the dclivery valve at the bottom of the hot well is of similar construction. The top of the hot well projects just through the engine baseplate and is fitted with a gun-metal cover,. stuffing box and gland.

A connection on the side of the hot well and near the bottom forms the suction supply for the boiler feed pump whilst the waste water is discharged near thc top of the hot well and is piped to the waste water receiver. The bucket rod is of brass and the pump rod of silver steel.

Boiler Feed Pump.

The barrel is of cast iron, the top end just projecting through the engine baseplate. The gland and ram are of brass and the pump-rod of silver-steel. The valve chamber and valves are of gun-metal, the former being bolted to the barrel. A large air-vessel is fitted on the delivery side. A spring loaded relief-valve is provided on the delivery side and all pipe connections are made.

Main Steam Supply.

A double seated throttle-valve is bolted direct to the steam-chest and, at its other end, carries the main stop valve. A bend, a steam separator, and a short length of pipe completes the steam supply. All these fittings are of gun-metal and all are flanged. The steam separator is connected to a " Sentinel " type steam trap with a self-grinding valve, and the discharge from the trap is piped to the waste water receiver.

A steam pressure-gauge is fitted and mounted close to the vacuum gauge already referred to.

Lubrication.

The steam cylinder and slide valve are lubricated by a displacement lubricator mounted on a bracket cast on the bend in the steam pipe line. This lubricator, of gun-metal, is provided with a filling-plug, water drain, and needle control-valve, and is connected to the outlet side of the throttle valve.

Oil-cups with caps and syphon tubes are fitted to the following points, viz., top bearings of piston-rod straps, beam bearings, both ends of connecting rod, crank shaft bearings, and eccentric straps. All other points are provided with oil holes.

Finish.

All bright parts are well polished and are all lacquered. All painted parts have received six under-coats of paint and one finishing coat of enamel with the exception of the baseplate which is finished " matt."

Olympia Transformed.

Olympia, Kensington, for many years the most famous group of exhibition and display buildings in the world, is being brought thoroughly up-to-date at a cost of £250,000.

The Addison Road entrance and the adjoining offices have entirely disappeared and in their place a vast vestibule, four times the size of the old one, is being constructed, reaching from the pavement to the hall and having a covered way to the railway station. Another enclosed walk, 160 yards long by 20 feet wide, will give shelter from Hammersmith Road direct into Olympia.

The Empire Hall is being remodelled in order to provide the fullest space for all types of exhibitions. The important internal changes here involve the removal of the central stairways, their place being taken by up and down escalators to convey 4,000 people an hour to all the floors, while six large lifts are also available for the public. The alterations in the Empire Hall provide a light-well three times the present size and there is to be a glass roof of the most modern type. Immediately adjoining the halls and reached under cover will be a six-storeyed service garage to hold 650 motor-cars.

SHOPS SHED & ROAD

A Column of "Live Steam."

By "L. B. S. C."

Nothing Like Having a Change!

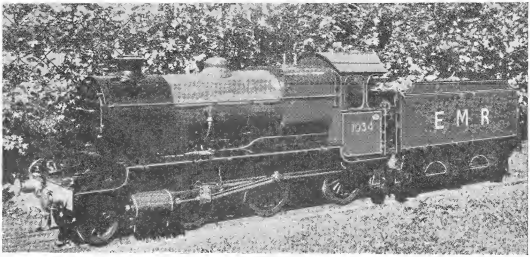
Followers of these notes will recollect that after the awful wreck on the Southern Railway some years ago, when "River Cray" jumped the road and hit Shoreham Lane Bridge, near Sevenoaks, all the tank engines of that particular type were converted into tender engines. Well, here is a picture of another tank engine which was converted to tender type, though for a very different reason. She was built by a Derby brother, Mr. A. T. Lee, and started out in life as an 0-6-0 "Pioneer," but did not long remain in that form. Bro. Lee took a fancy to the personal appearance of "Sister Dyak," and decided to rebuild his engine as a 5″ gauge or double-size edition, which he did, with very satisfactory results. She still retains the link motion, but the rest of the engine bears little resemblance to the original, and she would never be recognised. The pistons now have rings, and other improvements have been made; and the performance is good, inasmuch as she will haul half-a-ton easily, up a grade of 1 in 50, with a good healthy bark. A mechanical lubricator, same as "Maisie's", is now being fitted to her. Friend Lee concludes with a cheery reminder not to forget brothers who specialise in 5 in. gauge engines, when working out our further "schedule."

The "Dyak Sweep"—Important Notice.

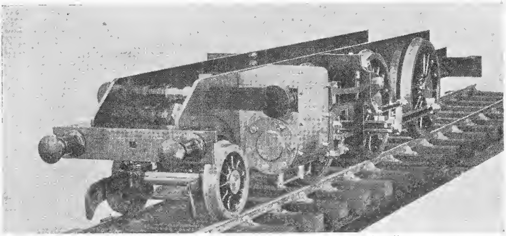
As our worthy Editor, in his footnote to Mr. Geo. Stevenson's letter offering a further "Dyak" prize, disclaimed responsibility for conducting a further competition and turned it over to your humble servant, no mention of it has been made in the Official Prize List for the coming "Model Engineer" Exhibition; but it is certainly not withdrawn! I have a pretty good list of entries, and have not received any intimation that any of the brothers who offered prizes, have withdrawn them; some of the locomotives have been tested, and passed the steaming and hauling conditions. However, several of the later entrants say that the job has taken far longer than they anticipated, and they could not hope to be through by September.

Well, I've thought matters over, and have come to the following decision. As the "Sweep" (so called because of the multiple prizes) does not appear in the "M.E." Exhibition list, there is no need to worry about a fixed closing date; therefore, those brothers who want more time to finish their engines, can have it. "It's a pity to spoil the ship for a ha'porth o' tar," says the old saw, and likewise it is a pity to spoil a job through undue haste; some of last year's entries bore outward and visible signs of a hurried scramble during the last week or two. The length of the time extension will depend on the entrants themselves—I'll be writing to them direct— and if not too long, we'll wait until all are finished. Meantime, anybody who wishes to show his engine at the Exhibition can do so in the Loan Section.

[This "Dyak" Competition is entirely an unofficial and separate contest, due to the generous encouragement given by the various donors of prizes, and to the friendly co-operation of "L.B.S.C." who desires to see as many "Dyak" builders as possible have a chance to secure some recognition of their work, and undertook to organise this competition for them. It does not therefore figure in our Exhibition Official Prize List, and no special prizes for "Dyaks" are offered by us at this year's show. We should, however, be pleased to show any of the completed engines in our



Mr. A. T. Lee's 5″ gauge "Pioneer-cum-Dyak."



Mr. A. Ohlin's fine job, mentioned recently in "Smoke Rings."

Loan Section, so far as space permits. Intending exhibitors should apply for a "Loan" entry form, and return it not later than August 24th. There is no entry fee for this section —Ed. "M.E."]

I don't know how Mr. Stevenson's "post-card census" of "Dyak" builders is progressing, but I *do* know this—that he was a wee bit premature in saying that he thought everybody who was going to build one of the engines, had done so! New "Dyakites" are bobbing up every week in my correspondence, and only last Monday (time of writing) one of our advertisers told me he had sold *over four hundred sets of* castings, parts and boiler material for "Dyak" engines. When Bro. Stevenson first conceived the idea of offeiing the "Sarawak Trophy," he "wrought better than he knew."

"Facts are chiels that winna ding—"

In the old days, if an engineman went on the carpet and the superintendent proceeded to address him in railroad Esperanto—and I might mention that most of the old gaffers were exceedingly fluent speakers in that dialect!—it was an unwritten law that the engineman was entitled to reply in the same language, without prejudice to the ultimate outcome. Likewise, as a criticism of certain of my statements was published in a letter on page 118 of July 30th issue, by the same token, as Pat would remark, I claim the right to make a public reply to same, ditto repeato.

If a valve gear gives good results, I praise it; if it is rotten, I don't hesitate to say so, and it doesn't matter a bean who designed it or made it in either case. The writer of the letter says that Bagnall's had been long enough in the locomotive business to know what they were talking about, and then infers that a raw student could teach them how to design valve gears, which seems rather inconsistent! However, whatever the valve gear was like when the engine came into Mr. Notter's possession, it is safe to assume that he did his bit towards making it the same as on the full-sized engines. In addition to that, I visited Mr. Morse's works at Woodmancote, on the Tuesday before the letter was published, and in talking about the old engine, I gathered that Mr. Morse had completely overhauled and reconditioned her, including the valve gear. Now I happen to know that Mr. Morse is very particular to have any valve gear and setting "just so" before the engine leaves his works; so it is also safe to assume that whatever the valve gear was when the engine arrived, it was "Morse" when she left.

Regarding the origin of the engine, I stated that *as far as I knew*, she was a Bagnall job. The writer of the letter admits that the design was Bagnall's and they supplied the castings; and the fact that the bits were machined up and put together at the "Poly," doesn't alter her "nationality," in a manner of speaking. By the way, who made the boiler—that was a job above the "Poly boys" weight, surely?

I maintain definitely, that the cylinders should have been "scale" size, and the argument put forward against this, is futile. It requires a certain amount of skill to drive a locomotive, and I've seen an eight-coupled engine lose her feet and spin like a buzz-saw when the regulator was smacked too far open by a careless engineman. *Any* engine will slip if mishandled, or if the rails are damp or greasy. *Without exception*, every one of the "calculation brigade" who have argued the point with me on the subject of adhesion, has conveniently ignored the fact that every locomotive is provided with a regulator or throttle by means of which the supply of steam to the cylinders can be perfectly controlled by any driver of average intelligence. Their idea of starting an engine is to do what our automobile friends call "step on the gas"; and when in consequence, the engine slips, they at once condemn her as being of bad design with cylinders too large. Nothing is further from the truth, as I'll endeavour to explain briefly in simple lingo.

If you met Max Schmeling, Primo Carnera, or some other gentleman with muscles of similar "bore and stroke," called him a you-know-what, and then stood still whilst he gave you a *full power* dot on the nose "per contra," you'd be on your back in a split second, counting more stars than the California astronomers will ever hope to see through their new outsize in telescopes; but if you jerked your head back instead of keeping still, you'd only get a low-pressure dot and would probably

keep your feet, although the initial punch-power was the same. However, the chances are he wouldn't hit with full force, not wishing to be had up for manslaughter, and would content himself with a playful jab, just sufficient to "teach you manners" The point to note is, that this wouldn't alter the fact that he *could* lay you out if he wanted to. If you tried it on with an ordinary individual with small muscles, his initial "full power" dot would probably take less effect than Max's "modified" one, whilst if you jerked your head back, you'd probably dodge it altogether; and he *couldn't* lay you out, no matter how he tried.

Now consider the parallel. Because an engine has big cylinders, it doesn't follow that you have to "give her the lot" to get off the mark, and no engineman in his right senses would ever dream of doing such an idiotic thing. The correct way to start a locomotive, big or little is to open the regulator carefully and give her just enough steam to get "hold of the load" as we called it. The steam enters the cylinders, and, finding stationary pistons, exerts just sufficient force against them to start the train from rest, corresponding to Max's "modified" punch. As the engine gets under way, the pistons begin to "run away from the steam," therefore, in order to keep up the acceleration, more steam has to be admitted, corresponding to Max's full-power punch when you jerk your head back. Just as the full power punch would have knocked your "stationary" block off, so would the steam now being admitted, have given such a mighty shove to the pistons that the wheels would have lost their grip and slipped. As they are literally jerking their heads back from the onslaught of the steam, they receive a much less violent punch and there is no slipping; merely steady acceleration of their movement. When Bro. Steam has got Messrs. Piston well on the run, you notch up, and he then just gives them a flick at each end of the stroke, just to remind them that they have to keep on running, or else he'll have to give them a few more playful jabs, which he promptly does when you drop the lever a bit going up a bank.

Now there are two facts which even the most elementary school child can easily grasp, viz. that the larger the piston is, within reason, of course, the more surface is presented for the steam to push against. Secondly, if the steam enters the cylinder at a constant speed, the faster the piston runs away from it, the lower will be the pounds-per-square-inch, on that piston. If the pistons of a locomotive are of the size advocated by the writer of the letter, that is, so small that they are only just able to slip the wheels at full boiler pressure, you have to "give her the lot" to get a start, and have nothing more left to aid acceleration. As soon as the pistons begin to run away from the steam, pressure on each square inch of their area falls, same as on the big one; but as the regulator is already wide open and the lever in full gear, you cannot get any more "follow-up" steam in. The acceleration falls off, and presently the pressure on the total area of the small pistons balances the resistance of the train, friction of working parts, etc., etc., and instead of being able to notch right up and let the engine settle down to a steady but swift run, the steam has to chase the poor little pistons up and down the cylinders and keep punching away as hard as it can at them, to keep the load on the move. This has been proved often in both big and small practice.

The last lot of Stirling eight-footers had cylinders 19½ in. by 28 in. and 19¼ tons weight on the single pair of driving wheels. The G.W. singlewheelers of corresponding date had cylinders 19 in. by 24 in. and only eighteen tons on the driving wheels. The Midland engines' cylinders were 19½ in. by 26 in. with 18½ tons on their driving wheels. All carried pressures from 170 to 180 lbs., and all the engines were remarkably successful. These examples prove that it is *not* weight on the driving wheels that makes an engine hold the road without slipping; it is the friction or "bite" betweeen wheel and rail, plus the skill of the arab at the regulator handle; and as many brothers who follow these notes are tickled to death whenever I indulge in any true life reminiscences, I'll just quote an instance which confirms it.

On Sunday afternoons in late Victorian and early Edwardian days, the locomotive sheds presented a parallel to Goldsmith's "Deserted Village". The train service being merely a skeleton, the sheds were full of long lines of dead engines, goods and tanks mostly, and the personnel on duty at the one I'm speaking about, consisted merely of the loco foreman, a yard driver and fireman, a couple of boiler-washers, a fitter and mate, and a fire-lighter. Owing to some misunderstanding between locomotive and traffic depts., an engine was required at short notice to work a fast train out of London Bridge in the early evening, and a frantic telephone call was put through to the shed. The easiest main-line passenger engine to get out of the conglomeration was a single-wheeler (347 "Dallington," if memory serves me aright), standing third from the end of the first row in the shed at the south end of the yard, and the foreman told the firelighter to light her up as quick as possible. In the haste, he didn't notice that the water was low, and on going back some time afterwards to look at the fire, saw to his alarm that the water was right down in the bottom nut. Meantime, to save routing out a fresh crew, and to make a bit of overtime, the yard engine-men had volunteered to work the train, and had slipped home for tea-bottles and tommy-bags and clean overalls; the foreman had temporarily disappeared (needn't explain where —you can guess!) and as the engine only had pumps and no injectors, the firelighter was in a bit of a stew as to what he should do, when the fitter came to the rescue. The engine was showing about 60 lbs. on the "clock" so they screwed the tender brakes hard on, also the brakes of the two engines in front, stuck a ball of tallow under each driving wheel, put her in forward gear and let her have it, with both feed pumps full on. By the time the foreman returned from his temporary absence and had come over to see what all the commotion was about, she had over half a glass of water and the blast had done the needful to the fire. The affair passed off with

a few exchanges of railroad Esperanto, and no harm was done to the driving wheel tyres, so nothing more was heard of the episode, and the engine duly went to London Bridge and took the train. I was up there and saw her pull out. Now note this: in the shed, the driving wheels went around like a windmill in a hurricane, with low steam pressure. At the terminal with sixteen on, she glided out, blowing off and with half regulator, without the ghost of a slip—and I'll swear a solemn oath that no alteration was made to the weight carried by the driving wheels, in the interval between! 'Nuff sed.

American engineers long since found out that by increasing the size of the cylinders far away above the "slipping point", they could sustain full tractive effort up to 55 m.p.h. or more, in place of a bare 37 with "calculated" cylinders. Going to the other extreme, "O" gauge, you may remember the two commercial engines I rebuilt. Originally, the 4-4-0 hauled three coaches, and the 4-6-2 hauled five, neither maintaining pressure. The first thing I did was to open out the bores as big as the castings allowed. When through, the former engine hauled 16 coaches and the latter 27, continuously; and the engines were demonstrated afterwards, by their owner, to representatives of the firm who originally made them, and who could hardly believe the evidence of their own eyes!

They say history repeats itself, and it certainly does; for all this wailing about insufficient adhesion is merely a useless reiteration of the laments of 120 or more years ago, when locomotive builders coupled all their wheels, and old man Blenkinsop went so far as to put a rack all along his line, with cogged driving wheels on the engine gearing into it. It was a bold move, but a common-sense one on the Stephensons' part when they cast conventional ideas to the winds, and designed and built the first single-wheeler, viz "ye olde Rocket." Cylinders 8 in. by 17 in.—and $2\frac{1}{2}$ tons adhesive weight—gee whiz!

Finally what about Miss Milly Amp? The weights on the driving wheels of her motor coaches are far less than on any steam locomotive, but the motors are powerful enough to spin them like a catherine-wheel. How is it that they get away without slipping, and with such a marvellous acceleration? Simply because the controllers have several notches, and regulate the juice in the same way that an engineman who knows his job, regulates the supply of steam to his big-cylindered locomotives. As Bobbie Burns truly wrote:—

"Facts are chiels that winna ding,
And downa be disputed."

First Steps in Model Engineering.

Workshop Advice, Experience and Philosophy for Readers of all Ages.

By "INCHOMETER."

Flywheel of Elementary Steam Engine.

In a previous article, I have mentioned an elongated boss which may be grooved for use as a driving pulley. This is shown in the accompanying photograph of the engine flywheel. Before drilling the central hole in a casting of this sort, ascertain if the boss is concentric with the rim. With a true pattern and a well moulded and poured casting, the boss will be central, or nearly so. But it may happen that the boss is considerably out of centre. If the diameter is plenty large, compared with that of the hole, chuck the casting, so that the rim is true, and ignore the boss, running untrue. But when there is not enough excess of metal, average the eccentricity between boss and rim. That is, chuck the casting so that both run slightly out of centre, the error being divided between them. Strictly, you should give preference to having the rim part true, for sake of balance, yet a very weak boss is liable to crack and, perhaps, a piece split away, with a brittle material such as cast iron. This is the sort of matter for one to use discretion and judgment, I mention it to illustrate general practice where a casting to be chucked and bored happens to be warped or distorted. A turner would adjust the setting so that out-of-exact-position, or concentricity of bosses, rims, or other features, is averaged over the entire casting, before finally clamping it fast and proceeding with boring, turning, or drilling. Similarly, with chucking a casting on the table of a planing, milling, or shaping machine, it is not a matter of giving attention to one part only, the setting would be adjusted to enable all machining to "clean up" the various surfaces. Actually, the machining is often not a difficult part of the work involved, chucking and setting may require even greater skill, experience, and judgment. If you clamp a piece so that it is sprung by the pressure, the machined surfaces will be out of truth when the piece is released. Further, removal of the "skin" or surface, is liable to release inherent stresses so that warping occurs when the piece is freed. Allowance may be required for this by releasing and then rechucking after a preliminary "roughing" cut has been applied.

The art of machining does not consist only in directing and manipulation of the cutting tool. It requires knowledge of, and experience with, the natures and properties of materials, and their behaviour under conditions of machining practice and exigencies. Troubles, you may find, in model engineering can be owing to no fault of yourself, but to lack of this knowledge.

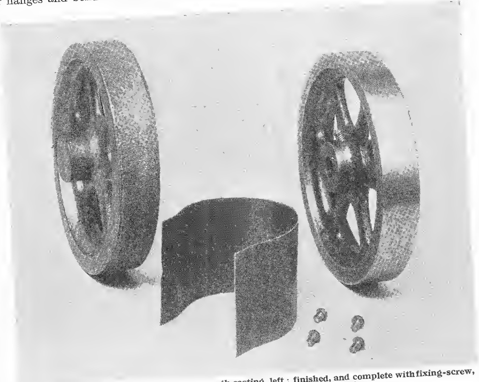
Lagging the Cylinder.

In steam engine practice a covering of material is usually applied to, and fastened to, the cylinder, for the purpose of minimising radiation of heat. This covering is termed a lagging, a cylinder thus treated is said to be lagged. Asbestos, various preparations containing it, and slag wool are examples of lagging material or compound. The cylinder

of the engine I have illustrated is lagged by very thin blue tinted soft sheet iron. It is fixed in place by four small brass round head screws. Bend a strip of paper, or a length of thin wire around the cylinder; this, straightened, will indicate the required length of the iron. Drill the four holes to receive the screws whilst the iron is flat, when it has been bent and fitted to the cylinder it will serve as a templet for marking the positions of the holes to be drilled in the cylinder. Remember that a tapping drill is required, the holes must be screwed, it will therefore be of smaller diameter than the one used to drill the sheet. Alternatively drill the sheet with the tapping drill and enlarge these holes with a clearing drill after the holes in the cylinder have been drilled. If you adopt this plan, and cramp the bent sheet in position on the cylinder, the holes in the latter may be drilled without need for marking. Turn a piece of wood to diameter size of the cylinder flanges and bend the iron around this anything inside the lagging, the contained air will be a bad conductor of heat. With all lagging materials their effectiveness is due to the air locked up in the substance itself.

Steam Tightness of Joints.

Usual practice is to guard against leakage between surfaces at a joint by interposing a substance which will yield and conform to the surfaces when the holding screws or bolts are tightened. Various jointing materials are sold for the purpose, or a red lead putty is often used. It is spread over one of the surfaces whilst plastic, the joint is tightened, and the putty fills all irregularities and places where there may be lack of contact. Eventually, the putty sets hard and will resist tendency for steam to blow through the joint. In model engineering an insertion which serves the purpose, and is commonly used, consists of thin tough paper, the brown kind serves well, it is soaked in oil, or the substance termed goldsize



Flywheel of Elementary Steam Engine: rough casting, left; finished, and complete with fixing-screw, on right. Centre, sheet iron lagging for the cylinder.

or any circular object you may have of the correct dimension. Notice, for sake of neatness the cylinder flanges are to be reduced in diameter by an amount equal to the thickness of the iron. The lagging will then be flush with the covers; similarly, arrange for it to be flush with the top and the underside of the steam chest. Reduction of the flanges may be affected by filing or by turning in the lathe. To accomplish the latter method, mount the cylinder on a wood mandrel, rotate it by hand forwards and backwards; take light cuts with a turning tool. As a preliminary, file a small flat at the place the tool will start its cut and where it will finish, these will preserve the point and serve as a guide for depth. There is no need to pack obtainable from an oilshop. The joints of the steam chest, its cover, and of both the cylinder covers should each have an insertion of the kind. Cut the paper neatly to dimensions of the joint surface, use the cover as a templet, from which the holes for the studs to pass through can be pierced.

Shrinkage of Castings.

A letter from my versatile engineering friend in Upper Assam, India, diverts my mood from "cut and dried" technics, I am in conversational and philosophical vein, inclined to offer gentle and soothing comment upon matters he has communicated. This is a correspondent of sometime standing, to whom I replied in my

article of January 16th, about a difficulty in screwing with solid dies. Acknowledging, he sent useful news about his activities and way of preventing tools from rusting in a hot and moist climate, mentioned in the issues of March 26th and April 30th last. He has experienced much trouble and dissatisfaction through castings which have not had enough margin of metal to allow being worked up to drawing sizes and infers that they have been cast from the finished parts, and not from patterns in which adequate allowance for shrinkage and machining is provided.

Casting from a Finished Article.

With repair work and in special circumstances, one casting only being, perhaps, required, it is practice for avoidance of the cost involved by having a proper pattern made, to let the article itself serve instead. Broken parts might be temporarily joined, or be put together in the sand, by the moulder at the foundry. Core prints of simple kind would be put into holes or spaces, temporary thickening be fastened on surfaces requiring to be machined, or the moulder instructed to knock the article in the sand so as to widen the impression, and give a casting slightly larger than the original. It is a "make do" and can be serviceable by judgment and experience, if circumstances are sufficiently favourable and warrantable. But one properly expects castings, sold by a trade firm, will have been cast from patterns which have provided a margin for shrinkage and finishing.

Casting from Patterns.

A pattern, from which castings requiring to be machined will be moulded, should have two allowances, it will therefore be of larger dimensions than the finished article by these two allowances. One is to compensate for the amount the hot cast metal will shrink, or contract, as it cools down, the other is to provide excess material for removal by the cutting tool. For example, the flywheel shown in the accompanying photograph. The rough casting at the left is of larger diameter and width of rim than is the finished casting at the right of the photograph; the boss also has greater length and diameter than the boss of the finished article. This is the allowance for finishing, but the pattern from which the wheel was moulded is larger than the rough casting by the amount allowed for shrinkage. You will recollect these provisions when you are making a pattern from which a casting is to be moulded. Remember also, if a hole is to be cast in it, by coring, the print and core require to be smaller by the two allowances; the hot metal shrinks from all directions.

Allowances for Shrinkage and Finishing.

Regarding shrinkage, a common allowance with cast-iron is $\frac{1}{8}$ inch for each foot of length, that is, if the flywheel referred to is 6 inches diameter, the pattern would be made $\frac{1}{16}$ of an inch larger to allow for shrinkage alone. But the amount depends somewhat upon the size, quality of the iron, and form of the casting. Shrinkage allowance for other metals may be reckoned approximately as follows, brass and copper $\frac{3}{16}$ inch, lead $\frac{5}{16}$, zinc $\frac{1}{4}$ inch: aluminium $\frac{1}{4}$ inch per foot length. Allowance for machining is a matter of experience and judgment, it will depend considerably upon the dimensions of the castings. Within fair reasoning allow plenty of metal to come off, the surface of the casting may contain imperfections, hollows, and perhaps warp somewhat, if there is ample allowance these, generally, can be cut away without infringement of drawing dimensions. Machining allowance increases with size, you would allow more on a 12 inches diameter wheel than with one of 3 inches diameter.

A Grievance from Overseas.

My correspondent, when home on leave last year, purchased, in London, a complete set of castings for a model engine, and for which he paid "a bonny price". He checked the parts with the accompanying blue prints, and verified them as correct in quantity and correspondence with the design. Having returned to Assam, and brought the set with his effects, he started to build the model and now informs me that he is "disappointed with the whole thing". He relates his trouble thus "The castings are first class, as far as castings go, metal excellent, but they must have been cast off a finished article as they are all small to the sizes given on the drawings, not enough metal to clean them up. The wheels, I find, are the worst of the lot the rims not being true with the bosses. The crank was already made, built up and welded, but the job is badly done, is not true, and one of the welded joints is slack. Will just likely cut one out of solid. I hope, ultimately, to make a better job of it than the original, but my grouse is that they should charge such a large sum and not supply good work."

Notifying Errors and Mistakes.

This part of his letter gives me sympathetic concern and induces my respect for the moderation he has shown in relating his trouble. There is no mention of name or display of animosity towards the supplier of the goods. When an incident of the kind happens. even if trifling, a customer should always let the maker or dealer know about it and give full information. With the best of care and intention, mistakes and inadvertance will occur. Probably, this set of castings and the faulty crank have come through by mischance, the right course is for the makers to be informed of the circumstances.

Comment about the "M.E." in General.

There is a kindly comment from my Assam, friend. "Personally I read the paper through from cover to cover, but as I know little about locos, and have never built one or worked on one, I am not very interested. It is the odd bits of advice I get from your sort of article, the small article regarding a fitment for a lathe or other machine, these are the articles I read over and over again. I do not always agree with what I find in the paper, and often think that the designers fall from the narrow way in making their gadgets too complicated, and very often not strong enough, It may be my fault. I like to make a thing with a good margin of safety."

This suggestive comment is of a helpful nature, thank you, "Mr. Assam reader" for your interest, the pleasant encouragement you have expressed and your compliment in sending by Air Mail; we shall hope to have news from you again.

PETROL ENGINE TOPICS

Multi-Cylinder Engines.

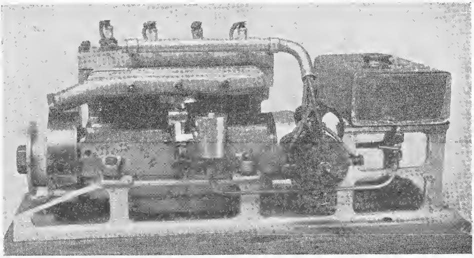
By EDGAR T. WESTBURY.

MANY readers deplore the fact that builders of model petrol engines do not seem to have heard of any other type of I.C. engine but a "one-lunger," to judge by their productions, at any rate, and I am often urged to try and stimulate more interest in the modelling of multi-cylinder engines. There is no doubt that a modern motor car engine, for example, offers excellent scope for modelling on a small scale, and the work in it is no less interesting than that in any other type of engine; but in most cases the result, from the point of view of appearance, is not very satisfying, on account of the total enclosure of nearly all working parts and the cold austerity of the external design. Nearly everyone who takes up the construction of model I.C. engines, however, has an eye to utility, and in this respect, the shortest cut to the achievement of a given result is generally a single cylinder engine. Multiplication of cylinders and other essential parts is regarded as a very dubious course from the point of view of efficiency, to say nothing of the extra work involved.

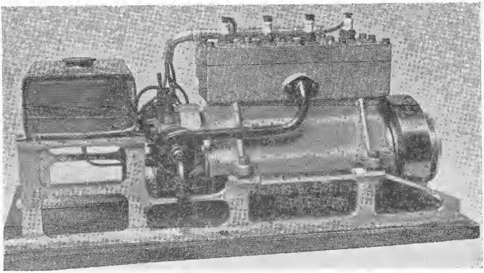
Nevertheless, there have been some very fine specimens of multi-cylinder engines produced at various times, one or two of which have been of quite outstanding merit considered as models alone, apart from being capable of really good working performance. For instance, the radial aircraft engines made by Mr. Gerald Smith; the earlier of these had five cylinders, and the later one, which won the "M.E." Championship Cup in 1930, no less than eighteen cylinders! A very fine six-cylinder marine engine was shown at last year's "M.E." Exhibition, and the year before that, an unfinished four-cylinder engine, typifying modern sports car practice, was shown.

The total cubic capacity of such engines is, however, usually far greater than that of the single-cylinder engines employed by the "utilitarians," and the added difficulty of getting extremely small cylinders to function efficiently, and in complete unison, constitutes yet another reason for fighting shy of them. A four-cylinder engine, to come within the popular 30 c.c. limit, would have to be under 7.5 c.c. per cylinder, or approximately 13/16 in. bore by $\frac{7}{8}$ in. stroke. (It may be noted that some encouragement to designers of multi-cylinder engines is offered in the rules of the "M.E." Speed Boat Competition, where they are allowed 40 c.c. total capacity, or about $\frac{7}{8}$ in. bore by 1 in. stroke, in a four-cylinder engine, against 30 c.c. for single cylinder engines. A similar allowance for encouraging the development of multi-cylinder engines was once adopted in certain motor cycle races.)

I have never yet seen an engine as small as this, although I have known many hopeful designers to embark, with all the confidence of inexperience, on multi-cylinder engines so small that even the smallest obtainable sparking plug would form an adequate cylinder head! Alas, none of these intrepid explorers of uncharted and unfathomable



Mr. W. Savage's 50 cc. four-cylinder engine; view on manifold side, showing carburettor and ignition distributor.



Other side of engine, showing water circulating pump.

oceans have ever returned to tell the tale! Until some evidence is forthcoming as to the prospects of real success with very small engines of this type, there is little chance that they will attract the petrol engine constructor who requires an engine for real work. Personally, I confess that there are so many unplumbed depths in the most simple of single-cylinder engines that I see very little prospect of finding time to experiment with the " multi's." But at the same time, I feel sure that intelligent effort, directed to the production of a four-cylinder engine within the 30 c.c. limit, would stand a good chance of a thoroughly successful outcome in respect of general running performance, though possibly not so high in maximum power output as the single.

The smallest successful working four-cylinder petrol engines I have so far encountered, have been of about 50 c.c., that is, 1 in. bore by 1 in. stroke. Such an engine was introduced, and castings put on the market, about three years ago by Mr. Elmer A. Wall, of Chicago, in both side valve and overhead valve types. There is no doubt that this is a thoroughly practical and efficient engine, and readers who wish to try their hand at making a four-cylinder engine may be assured that, with reasonably good workmanship, an engine, built from a set of these castings, will perform well. I mention this because in some communications I have received, doubt on this point is expressed or hinted at.

Mr. Savage's Four-cylinder Engine.

An engine which is similar in many essential points to the Wall engine, and of the same bore and stroke, has been constructed by Mr. W. Savage, of the South London Experimental and Power Boat Club, who intends it for duty in a fairly large model cruiser; a job for which I am quite sure it will be entirely adequate.

As will be seen from the photos, the engine is quite a fair representative scale model of modern automobile or light marine practice, having monobloc cylinders in aluminium alloy, fitted with cast iron " wet " liners. The cylinder block is extended downwards to form the top half of the crankcase, and the main bearings at the two ends are in the form of endplates which embody ball race housings, a further plain bearing being fitted in the centre. The camshaft is spur-geared, and operates side valves through tappets which bear directly upon the cams. A horizontal cross shaft, skew-geared to the camshaft, drives the ignition distributor at one end and the water circulating pump at the other. The cylinder-head is in one piece to cover all four cylinders, and has a cored water passage communicating with the barrel jacket by a number of holes around the bores. A very neat and ingenious form of inlet-exhaust manifold is fitted, in which the exhaust passages are taken through a chamber which forms the inlet distribution pipe. The effect of the heat thus communicated to the charge is to prevent any tendency to unequal distribution, and very much improves general running; on the grounds of high efficiency, there might be some objection to this course, owing to the expansion of the charge causing a loss of volumetric efficiency, though not to any very pronounced extent.

The carburettor fitted to this engine is of the type described in the issue of the " M.E." dated December 19th, 1935, which has a barrel throttle and an inclined plain jet, and is adaptable to either vertical or horizonal fitting. Mr. Savage has equipped it with a very useful refinement in the form of a strangler for starting purposes, and after some pains taken in its adjustment, is able to obtain good control over a fairly wide speed range up to a maximum of about 6,500 r.p.m. This should be a very useful feature in the type of boat in which the engine is to be installed.

Lubrication is by means of a cam-driven plunger pump which forces oil to the centre crankshaft bearing, from which it is conveyed

by drilled passages to all four big-ends. The problem of drilling these holes was solved by mounting the crankshaft on a vertical slide on the lathe saddle, elevating it and swinging it to the correct position to operate on by means of a drill running in the lathe chuck.

Mr. Savage intends fitting a clutch and reverse gear to the engine, and knowing his skill and particularity over details, I feel sure that the complete boat will be an outstanding model from all points of view.

The weight of this engine compares very favourably with that of a single-cylinder engine of similar total cubic capacity, being only slightly over six pounds complete with carburettor, ignition distributor and water pump, but exclusive of the tank and girder frame shown in the photographs.

Notes on the Design of Four-Cylinder Engines.

Leaving twin-cylinder engines out of account, as hardly qualifying for the term "multi," no type of engine in this class is more mechanically simple or straightforward in design than the good old "straight four," which is surely the most common and familiar of them all. The great danger, in designing one of these engines on a small scale, is that familiarity may breed contempt, and cause the designer to disregard mechanical problems which are by no means obvious from examination of the prototype, simply because they have been eliminated by many years of practical development, for duty which involves a fair proportion of abuse, and quickly reveals the weak spots. A few years ago the design of light marine engines was lagging well behind that of corresponding automobile engines, mainly because it lacked the searching tests applied to the latter by clumsy drivers ; this condition, however, does not exist at the present day.

But I am digressing; what I wished to point out is that many prospective designers of engines are liable, according to the evidence of designs I have examined, to dive right off the deep end with an ambitious scheme, without having seriously studied mechanical problems, or even recognised that they exist. One might get away with it first time, by adapting superficial features of an existing prototype, but it is just as likely that some very vital factors would be omitted. The structural design of a motor car engine looks extremely simple, but a very close and intelligent examination will show what pains have been taken to ensure strength and rigidity against various stresses, including tension between cylinders and bearings, twisting forces between bearings and mountings, and also "couples" tending to tear the engine in half. The latter in particular is very rarely recognised by the casual observer, but is really a very important factor in all "in line" engines, becoming more serious as the length or number of cylinders is increased. It arises out of the method of balancing such engines, which is known as "mirror" balance (i.e., one half of the crankshaft system is a replica of the other half as would be seen in a mirror) the object of which is to oppose the unbalanced couples in the two ends of the system against each other, so as to neutralise them. Obviously, the shorter an engine can be made, the more rigidity against these couples is obtained, and that is one reason why many designers support the shaft on only two bearings, the shortness and stiffness of the engine as a whole being considered more important than the extra support to the shaft afforded by one or more intermediate bearings. Stiffness of the crankshaft is very important in this case, but is actually easier to ensure than when intermediate bearings are employed ; in very long "straight" engines there is a very pronounced tendency for the shaft to "wind up," and the straight sixes and eights of a past decade were often liable to permanent shaft deflection, to such an extent as to have a marked effect on the timing, from this cause.

A centre bearing is, however, generally found beneficial if an ample crankshaft section is employed, and can be introduced with very little increase in the overall length.

Few, if any, modern engines are made with separate cylinders, and there is little to recommend the practice on a model, except perhaps in the case of an ultra-light air-cooled engine. The monobloc system is undoubtedly the simplest for water-cooled engines, and dispenses with a multiplicity of joints and attachments, which would call for considerably more work in both construction and assembly. There is also much to be recommended in the common practice of extending the cylinder block downwards to form the top half of the crankcase, and in cases where a light alloy casting is used, the employment of cylinder liners naturally follows. These should be of the "wet" type, if only for the purpose of simplifying the coring of the water jacket, and little difficulty need be anticipated in fitting them to be both water- and gas-tight, with reasonable care in workmanship. Even on the smallest engines, I strongly recommend going to some trouble in water-cooling the head ; if the coring of small passages is deemed impossible, the casting may be simplified by leaving an open top, which is afterwards closed by a cover plate having due provision for preventing water leakage around the sparking plugs, which in most cases must pass through it.

There is plenty of scope for neat layout and efficient operation of valve gear in a four-in-line engine, whether the valves are situated at the side or in the head. In the latter case, direct operation from an overhead camshaft is an attractive proposition, and may be carried out with much less difficulty than in the case of a single cylinder engine. This arrangement, on a very small engine, provides better accessibility than even the simplest side-valve gear. The camshaft may be very efficiently driven by a train of spur gears, one of the idlers in which may be employed to drive the ignition distributor or other auxiliary gear.

In any multi-cylinder engine, gas distribution is something of a problem, and I do not

recommend trying to solve this in a manner common to modern racing cars ; that is, by separate carburettors. It will be found a far more difficult problem to synchronise four tiny carburettors than to dodge piling-up troubles in a single distribution pipe, and a hot-spot manifold will usually help matters, even if it does reduce power somewhat.

Other Forms of Multi-Cylinder Engines.

While there are many types of engines besides the "straight four," some of which offer excellent scope for producing a really fine model, I cannot see much future in them from the utility point of view. One can hardly adapt an engine of, say, the radial type, to a power boat in a really efficient and accessible way, and model aircraft enthusiasts are at present much too busy trying to find a single-cylinder engine small enough to allow of building a 'plane of reasonable size round it, to be very concerned with following prototype engine design. Several years ago I designed a three-cylinder radial engine for a model aircraft enthusiast, and it is rather significant that it has never been used. Neither have we heard further from the worthy gentleman who intended to produce a 30 c.c. replica of the 16-cylinder Rolls-Royce "Eagle" engine for an attack on the model speed boat record!

Postscript

Shortly after writing these notes on multi-cylinder engines, I noticed the description of Mr. Hadlow's engine in the July 23rd issue of the "M.E." This is quite an interesting job, but its size and weight put it rather outside any purpose at present within the true scope of model engineering ; in fact, its capacity, which is rather more than 120 c.c., is larger than some engines produced commercially for industrial, marine and motor cycle work—I refer, of course, to single-cylinder engines in this case.

I have also received from the Editor some details of a very interesting overhead-camshaft four-cylinder engine produced by an overseas reader, and hope to be able to describe this at a later date.

The Windsor Model Aero Club (Manchester)

(Incorporating The Mersey Model Aircraft Club, Manchester Branch).

Northern Model Aeronautics.

The accompanying photograph shows a modified scale model of the well-known "Hawker Fury," and is the work of Mr. A. A. Hutchinson, of the Windsor Model Aero Club, Manchester. Constructed entirely of balsa wood with sheet balsa covering the nose of the machine, it certainly is a very interesting piece of work. The span of the main-plane is three feet six, and the leading edge is, like the nose, covered with sheet balsa. It will eventually be powered with a geared rubber motor.

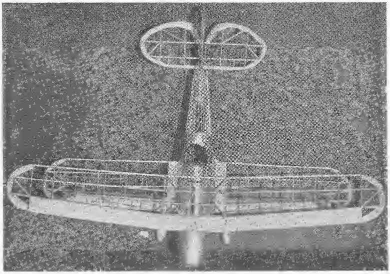


Photo by] A semi-scale "Hawker Fury," by Mr. A. A. Hutchinson. [*J. B. Parkinson*

Northern Club News.

The members are at present extremely busy preparing the new room which has been taken over at the club centre; this is to be fitted out as a lounge, and the "technical lads" are already at work on installing the new wireless set.

The Club was pleased to welcome the Northern Heights Club, of London, on August 9th, and this meeting was held at Woodford Aerodrome, Cheshire, by kind permission and co-operation of Messrs. A. V. Roe and Co., Ltd., and Lancashire Aero Club. The Southern visitors were entertained at the club centre later on in the evening.

Hon. Sec., E. C. Daniels, 17, Sibson Road, Chorlton-cum-Hardy, Manchester.

QUERIES and REPLIES

Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.

7,112.—Moulding Material and Solder for Aluminium.—G.A.J. (Cardiff).

Q.—I have been trying to turn out some aluminium castings, but have so far been unsuccessful owing to failure of moulds.

Could you tell me where I could obtain a suitable moulding material, and whether it is sold in reasonable small quantities?

Also, where can I obtain a good solder and flux for soldering aluminium?

A.—Moulding sand and other foundry materials and equipment may be obtained from Messrs. H. G. Sommerfield Ltd., 7, Tavistock Place, London, W.C.1.

A successful aluminium solder, known as "Alusol," which is used without any kind of flux, may be obtained from Coventry Aluminium Engineering Products, High Street Chambers, Coventry.

7,095.—The Development of Model Hydroplanes.—A.M.P. (Maidenhead).

Q.—I am interested in the development of model hydroplane hulls, and propose to experiment with small hulls.

It is my intention to commence at the beginning, to shut out all conventional or orthodox theories and not to accept any until I can prove them right to my own satisfaction, (very egotistical, I will admit, but necessary in independent research). The trouble is to commence at the beginning, since while I know that a hydroplane is made essentially to skim over the surface of the water, I cannot find out who was the first designer of a hydroplane hull, what were his ideas in designing the hull to such a shape, and what conclusions made him decide that a step, or steps, cut in the hull would make it skim better.

Can you answer the three points mentioned in the last paragraph? Can you also suggest a book or books on the subject of the evolution of these hulls?

A.—The type of hydroplane which is most commonly employed at the present day, that is, the "single-step" hydroplane, having two planing surfaces, was originally invented by the Rev. C. M. Ramus, in the latter half of last century, who referred to it in his patent specification as a "polysphensic ship." The history of his experiments, is in our experience, very difficult to trace, but some information might be obtained from the Patent Office Library. For many years the Ramus type of hydroplane (sometimes termed the "Ricochet" hydroplane, after the name of one of the inventor's boats) was comparatively little used, due to the difficulty of designing an engine with a sufficiently high power/weight ratio to do it justice, but with the advent of the light I.C. engine, interest in this type of craft was renewed. We do not know of any literature dealing with the evolution of hydroplane hull design.

While your proposal to start from first principles, in experiments with hydroplane design, is quite a good one in respect of avoiding prejudice or pre-formed ideas, it entails a risk, amounting almost to a certainty, that you will incur a great deal of unnecessary work, and likely enough, finish up by re-discovering something which has already been accomplished. We should certainly advise you to obtain all the data you can on the subject, and one of the best ways of doing so would be to consult the Patent Office Abridgements of inventions relating to craft of this type. In this way, you would obtain an insight into the various ways in which the problem has been tackled by inventors, without being side-tracked by conventional or orthodox theories. Some very interesting discussions on the subject of hydroplane hull design have appeared at various times in the correspondence columns of the "M.E.," and we are of the opinion that some of these attempts to get to the root of the matter would be of assistance to you in your researches.

7,094.—Soft Soldering a Model Boiler—H.G. (Glasgow).

I am making a model boiler 9″ long by $1\frac{3}{4}$″ dia., with nine $\frac{1}{4}$″ water tubes for driving a boat, but am unable to silver solder. Looking up some back numbers of "M.E.", there is one in which "Ajax" gives a design for a 7″ × $2\frac{1}{2}$″ boiler, but without water tubes, and he advises to soft solder it, as the pressure is low. Now could I soft solder my tubes to stand a pressure of 20 lbs. or 25 per sq. in., I want this boiler to supply steam for two $\frac{5}{8}$″ bore × $\frac{5}{8}$″ stroke vertical engines; there would be no fear of water running out, as boiler will have a feed pump working off eccentric.

A.—It is quite practicable to soft solder your boiler, providing that the pressure does not, under any circumstances, exceed 25 to 30 lbs. per sq. in., and that the soldered joints cannot become dry at low water level. Both the boiler ends and the water tubes should be closely fitted, and tinned before assembly. The use of pure tin instead of solder for making the joint would allow of withstanding higher temperature with safety; but a soft soldered boiler cannot be guaranteed beyond all suspicion, owing to possible chemical or mechanical deterioration of the solder employed, and a brazed or silver-soldered boiler would be in every way preferable.

Business Enquiry and Reply.

Lead Castings.

Q.—Please advise me of the name and address of a foundry turning out fine lead castings.

A.—John Hill and Co., 2-22, Britannia Row, Essex Row, London, N.1.

(Brighton, 891.)

PRACTICAL LETTERS from OUR READERS

A Correction.

DEAR SIR,—May I be permitted to correct what appears to be an error in the short article on "S. W. Simpson's Day" appearing in the issue of "M.E." dated July 23rd.

The statement appears that my loco. was timed by Mr. Ferreira and that a scale speed of 180 m.p.h. was attained. I should like to point out that, through what is probably a misunderstanding, the speed appears to have been calculated on a ½ in. scale.

This engine is built to 2½ in. gauge, using a scale of 17/32 in. per foot, consequently she is much larger than a ½ in. scale engine and the correct timed speed should, I think, be given as 166 m.p.h., although she was still accelerating during one of the laps timed.

Yours faithfully,

Tooting, S.W.17. H. D. BOLDING.

Sub-Standard Cinematograph Projectors

DEAR SIR,—As a result of recent discussion on the above subject in the "Practical Letters" columns, the Editor has decided that the matter merits close attention, and in view of the writer's experience in this field, has invited his co-operation in producing a suitable design of sub-standard projector for amateur construction. There is no doubt that such a machine would form a very appropriate outlet for the model craftsman's enterprise, and would provide many hours of entertainment and instruction when completed. Readers may be interested to learn that the preliminary work on the construction of a machine has already been put in hand, but the object of this letter is to try to get in closer touch with the readers' requirements, as regards the real essentials of design and equipment.

Several readers have given their views on the matter, and while their ideas are mostly sound and relevant, the writer ventures to make some further comments regarding the practical essentials of such a machine. It is, of course, quite impossible to design a machine which will suit everyone's ideals; what we wish to do is to provide something which will suit the majority, and be sufficiently adaptable in respect of arrangement of illuminating and optical equipment to suit varying standards of quality or size of the projected picture.

It is unanimously agreed that the machine must be "a sound job—not a toy," as one reader suggests. The drawings at present in hand embody a substantial construction, erring if anything on the rugged and massive side. Castings are specified for the important items, with every care taken to ensure that they are machineable on the average amateur's lathes. Most readers will agree that machining away a good solid casting is more satisfying and satisfactory than bending and faking sheet metal into shape. The mechanical parts will be equally robust, with the minimum of gearing or delicate parts requiring fine adjustment. Gears will be "stock" components, obtainable from "M.E." advertisers, and of a far more solid and substantial type than are used in most commercial projectors of this class.

On the other hand, the projector, in its standard form, will *not* have "hot and cold water on every floor." Mr. George R. Stevenson, in a very interesting letter setting out his ideals, specifies a machine which would involve a cost of about £8 for materials. Very few readers, we imagine, would be in a position to outlay this amount, and our own ideas on the subject were much less ambitious.

It is suggested that the type of machine most likely to appeal to the majority of our readers would be one more or less equivalent, in its specification, to a commercial machine marketed at from £15 to £20. The drive will be either by hand or motor, according to facilities of the constructor, and any form or power of illuminant may be adapted, the general idea being to obtain reasonable efficiency with a modest wattage, rather than pile up the candle-power (and incidentally the heat of the illuminant) and introduce the need for further complications such as safety shutters, etc. The writer suggests that the possibilities of low-power illuminants have by no means been fully exploited, and many readers will be more interested in lamps which cost only a couple of shillings than those which cost £2 each. The craze for showing a "big picture" has been very much overdone, even to the extent of discomfort and eyestrain to the audience. Even in a small hall, the size of picture which can be included in the normal angle of vision by the observers in the *front row* is by no means large, and a small, brilliant picture is by far the most satisfactory, besides doing more justice to the film. High-power illuminants may be used if desired, but the question is, whether they are really necessary in the type of machine we have in mind. The reader who is dependent entirely on battery power must not be left out of our calculations; also, the one who uses electricity from a slot meter at a fairly high rate per unit.

The intermittent motion will be a simple type of claw, capable of elaboration or improvement to suit exacting standards, and feed and take-up sprockets will be provided, as these are considered essential to really smooth operation with minimum wear and tear of films. Spool arms to take full 400 ft. spools will be fitted as standard — not as "super attachments." Both objective and condenser lenses will be obtained ready-made, as amateur expedients in this department are

very rarely satisfactory. The only other finished parts which will have to be purchased are the lamp, the driving motor, if fitted, and the transformer, resistance or other means of adjusting the supply voltage to that required by the lamp.

Last but not least, the machine as specified will be built and thoroughly tested before being described, to eliminate the possibility of constructional snags or defects in design.

The specification as laid down is not, as yet, an entirely rigid one, and the further opinion of readers would be welcomed as to whether it is likely to meet, not the ideals of a single individual, but the collective reqnirements of the many readers who are interested in this subject.

Yours truly,
"KINEMETTE."

London.

The Inefficient Steam Locomotive.

DEAR SIR,—During the past twelve months a considerable number of very interesting articles and letters have appeared in the "M.E." re efficiency of steam locomotives.

I understand that it is practically accepted as an axiom that the cylinders of the most efficient locomotives yet built only turn to useful account about 10 per cent. of the energy supplied by the boiler, the remaining 90 per cent. being discharged into the atmosphere as waste heat. Somehow I find it difficult to believe that they are so amazingly inefficient.

Let us suppose that in a loco. working with a 25 per cent. cut-off, the initial pressure in the cylinders is 200 lb. per sq. in., then it follows that the terminal pressure will fall to 50 lb. per sq. in. It seems obvious that the temperature must fall in the same ratio, as the heat units will have spread out so as to occupy four times as much space. If it were possible to obtain perfect cylinders that lost no heat from either radiation or condensation, the number of heat units in each cylinder at the end of each stroke would be exactly the same as admitted up to the point of cut-off. Then, when the exhaust opens, the amount of heat discharged would be exactly the same as was admitted, which appears to indicate that perfect cylinders would actually waste *all* the heat supplied by the boiler and use *none at all* in doing useful work. This reminds one of Euclid's propositions that terminate in an absurdity.

For the purpose of comparison with the above, can anyone enlighten us as to the relative thermal efficiency of a compressed air locomotive working, say, in Northern Siberia with an initial pressure in the cylinders of 200 lb. per sq. in. and 25 per cent. cut-off, the temperature of admission being 0° Fahr? Obviously, the terminal pressure will be 50 lb. and the temperature of the exhaust $\frac{\text{Zero}}{4}$ so that there will be just as great a difference between the admission and exhaust temperatures as in the case of the aforesaid steam engine. Would it not be correct to describe both types of engine as equally inefficient?

Yours faithfully,
LAMBERT DILLON.

Bray.

A First Attempt at Model Making.

DEAR SIR,—I have just completed my first steam engine, at the Devizes Handwork Centre, at the age of 13. The instructor is Mr. F. W. Burt. The engine is of the oscillating cylinder type, and the lathework was done on a "Drummond" 4 in. round bed.

The working pressure is about 40 lbs. per sq. inch, and the boiler is a piece of 3 in. diameter copper tube 6 in. long with ends flanged and brazed. The fittings, which include safety valve and filling plug, are silver soldered in. The burner has three wicks, and uses methylated spirit. Galvanised iron is used for the firebox.

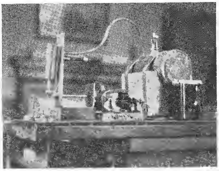


Photo by] **A Beginner's Steam Engine** [*C: W. Busby*

The engine is $6\frac{1}{2}$ ins. high, $2\frac{1}{2}$ ins. wide, and 6 ins. long. The cylinder is vertical and has a bore of $\frac{5}{8}$ in. and a stroke of $1\frac{1}{8}$ in.

Mounted on the base is a "Trix-Permag" motor, used as a dynamo.

Yours faithfully,
H. F. COOK.

Stert.

Ships' Port Holes.

DEAR SIR,—Assuming that the arguments are not wagers, and that "South Norwood" is too busy to dig out the information in the Library at South Kensington, then the following may form the basis of a reply to those alleged engineers.

About 1886, Cramps, of Philadelphia, imported a press from Scotland to enable them to perforate the bilge frames of the "St. Louis"; I do not remember its maximum capacity, but have sketches of punches and dies 30 ins. by 24 ins. and through $\frac{3}{4}$ in. plates. Either trepanning, punching or oxygen cutting is permitted on the usual 26/30 ton M.S. ship plates, but if high tensile plates are nsed, this will be a special survey, and the position of the holes will decide whether the two latter methods are permitted. Portable trepans, some with magnetic attachments, and for both circular and oval holes are quite common, but at the best are poor and slow substitutes for a proper machine.

Surely these "engineers" know that the tune of a ship is not composed on a building slip, but in the drawing office, where acres of tracing and blue prints are produced.

Yours truly,
H. G. BAKER.

Yorks.

Institutions and Societies.

The Society of Model and Experimental Engineers.

Meetings. At Caxton Hall, Westminster, at 7.0 p.m.

At our next meeting, on Friday, 11th September, there will be a departure from our usual programme. A debate will be held on the relative merits of Steam and Electric Traction from the point of view of the model engineer. After the debate has been opened by a speaker for each type of traction, other members will be allowed five minutes each to put forward their views, as far as time permits. It is hoped that many members will speak and thus make the evening a thoroughly interesting one.

Thursday, October 8th: Competition, Track and Model Night.

Full particulars of the Society, forms of application for membership and tickets of admission to one of the meetings and/or to the Society's workshop may be obtained from the Secretary, R. W. Wright, 202, Lavender Hill, Enfield, Middlesex.

The Derby Society of Model and Experimental Engineers.

The next meeting will be held on Thursday, August 20th, 1936, at the Cavendish Cafe, Corn Market, Derby, at 7.30 p.m., when Mr. Whitehead will deliver his lecture on "Railway Signals and Signalling."

All model engineers in the district are cordially invited.

Albert G. Sale, Hon. Sec., 31, Thornhill Road, Littleover, Near Derby.

The Manchester Model Railway Society.

Meetings for August are: Saturday, 22nd, visit to the L.N.E.R. Running Sheds at Trafford Park, Manchester. Tuesday, 25th, meeting at headquarters at 7.30 p.m. Hon. Sec., A. Peake, 8, Methuen Street, Longsight, Manchester 12.

The Kent Model Engineering Society.

The next meeting of the Kent Model Engineering Society will take place on August 21st, at 8 p.m., at the Club's headquarters, Sportsbank Hall, Catford, S.E.6.

This evening will be taken by Mr. T. Rowland, who will give a practical demonstration on using hand tools. The following meeting is for September 1st, when Mr. Vanner and Mr. Bernardes will give a joint lecture on "Boats." Those members who wish to take part in the all day outing either the first or second Sunday in September, should write in and secure their place in the charabanc. Full particulars of the Society can be obtained by writing to the Secretary, W. R. Cook, 103, Engleheart Road, S.E.6.

Finchley Model Engineers' Society.

On Wednesday, July 22nd, the Finchley Model Engineers' Society held a rally of model boats on Friary Park Pond, Friary Lane, Frien Barnet. Among the models shown by the members were Mr. West's Cabin Cruiser and Ocean Going Tug; Mr. Portious' model of the "Mauritania"; Mr. A. E. Smith's Steam Tug and Mr. S. C. Pritchard's River Type Cabin Cruiser. The evening was a great success, both for the Society's members and the general public, who took much interest in the running of the models. There is another rally on August 26th, when the Society hope for as good a show as before.

Fixtures for September are as follows:—September 2nd and 9th: Special meetings for the purpose of collecting together models for the "M.E." Exhibition. September 16th: No meeting at Avenue House. Members will be engaged erecting the stand at Horticultural Hall. September 30th: Lecture.

Further particulars from S. C. Pritchard, "Bishopswood," Bishop's Avenue, East Finchley, N.2., Hon. Secretary.

The Manchester Society of Model and Experimental Engineers.

The next meeting will be held on Friday, September 4th, 1936, at the Manchester Schools of Technology, Sackville Street, Manchester, at 8 o'clock. Open night.

Hon. Secretary, W. E. Wood, 20, Albert Place, Longsight, Manchester, 13.

Notices.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. Unless remuneration is specially asked for, it will be assumed that the contribution is offered in the general interest. All MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co., Ltd., 13-16, Fisher Street, London, W.C.1. Annual Subscription, £1 1s. 8d., post free, to all parts of the world. Half-yearly bound volumes, 11s. 9d., post free.

All correspondence relating to Advertisements and deposits to be addressed to The Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, W.C.1.

Contents.

The asterisk [*] denotes that the subject is illustrated.

SALES AND WANTS

EVERYBODY'S MARKET for ENGINEERING & SCIENTIFIC ELECTRICAL GOODS

Advertisements are inserted in these columns at the rate of **One Penny** *per word; minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

Advertisers who wish to separate *their announcements into distinct paragraphs must have not less than 20 words in any one paragraph followed by the word "Below"—which is charged for.*

"Box" replies, *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address).* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box——, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

All advertisements in these columns must be prepaid, *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—
General, Models, Wireless, Motoring, Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Holb.: 3818-3819.*

OUR DEPOSIT SYSTEM.

We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postages etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the deposit must be sent either by Postal Order or Registered Letter. **(Cheques cannot be accepted.)**

The fee mentioned above should be sent in stamps or by Postal Order as a separate amount.

In cases of exchange, money to the value of the article should be deposited by each party. **We cannot receive the articles themselves.**

General Supplies

Cheap Printing. 1,000 Billheads, 3s. 6d. Samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

Small Turned Screws Nuts and Washers. Assorted gross B.A., brass 2s., steel 2s. 6d. Whitworth, brass 3s., steel 2s. 6d. List and samples 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction, N.W.10.

Reduced Prices: Eureka Improved Air Compressors. Castings and Drawings from 9s. per set. Photo 3d.—POYSER, Peck's Hill, Mansfield.

"Maxspray" Electric Paint Spray Plants, £5 5s. complete.—JOHN M. E. STEEL, Bingley.

Air Compressors. New patent, 25s.; Super Spray Guns, 17s. 6d. Complete plants.—JOHN M. E. STEEL, Bingley.

"Fishponds and Aqaaria," by Rosslyn Mannering, with eight plates. Containing full details of how to make the fishpond, the stocking of the pond, breeding, pests and diseases, tropical and untropical fish and an extremely valuable chapter on "Don'ts for Aquarists." 1s. 6d., postage 3d.—THE PUBLISHING DEPARTMENT, PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, W.C.1.

Cheap. 7″ Lathe; Gas and Petrol Engines; Welding-forge; Double-Crankshafts.—16 Commercial Street, Cinderford.

Electric Lighting Plant, 100 volts, complete, seen running; 7½ h.p. Ruston Engine, Crompton dynamo, 120 A.H. accumulators, slate panel and meters; as new. Best offer, or would consider exchange machine tools.—RUBECK, Ormside Bungalow, Redhill, Surrey.

3 Plummer Oil Ring Bearings, 1½″, new, 15s.; ½ ton Stringers Chain Blocks, brand new, 30s.; double-ended Goodall Pratt grinder, condition as new, £1; ¾″ Brazing Blow-pipe, new, 9s.; 4″ Self-centring Steel 3-Jaw Chuck, brand new, 2 sets jaws, 30s. All guaranteed, all carriage paid.—CHAMBERS, 3, Eckington Road, South Tottenham, N.15.

Useful Countershaft (partics. on request), 50s., nearly new, 24″ ("Woden"), Buffing Spindles 2¾ x 1⅝; Pulley, 30s.; Water Cooled Hot Air Engine, £4 10s.; H.F. Vulcaniser (garage type), £3 10s.—GREENWOOD, Arnside Road, Southport.

Windmills Cast Head, with Eccentric and Shaft, less tail and wind wheel, 20s.; any part to order.—ROSE, 95, Bramley Road, Acocks Green, Birmingham.

"Machine Shop Companion." By Wallace Bentley, M.I.Mech.E. Contains practical notes, rules and tables for every-day workshop use, and a chapter on screw cutting; most useful reference book for engineers. 131 pages; 86 illustrations, 2s.; post free 2s. 2d.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1.

Old Engine Books, Beam Engine Cylinder, Taps, Dies, Chucks. List.—23 Reighton Road, E.5.

Detached Four-roomed Bungalow For Sale, with good garden and spacious garage equipped for model engineering and car repairs.—Apply, 84, Eton Avenue, Sudbury, Middlesex.

Express World Delivery. "Ornamental Turning," Evans (three vols.), 6s. set; "Simple Decorative Lathe Work," "Turning," "Possibilities, Small Lathes," Lukin, 6s. set. World delivery, carriage paid.—ALBERT FEATHER, Mail Order Boookseller, 93, White Abbey Road, Bradford, Yorkshire, England.

"Model Steam Locomotives." Their Details and Construction. By Henry Greenly, A.I.L.E. With 376 photographs, diagrams and working drawings. Choice of Scale and Gauge—Locomotive Types—The Principles of Model Locomotive Designs—Boiler Design—Construction Details: Frames—Axle-boxes and Springs—Wheels, Axles, Crank Axles and Crank-pins—Bogies, Pony Trucks and Radial Axle-boxes—Cylinders—Valve Gearing: Motion Details—Boiler Construction—Boiler Mountings and Cab and other Fittings—Tenders and Drawgear—Firing and Boiler-feeding Devices. Price 6s. 6d., post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1.

Home Cinemas

Movies at Home. How to make your own Cinema Projector. Particulars free.—MOVIESCOPE, (O) Pear Tree Green, Doddinghurst, Essex.

Home Cinematographs, mains or battery; standard films cheap. Lists: WAYLAND, 109, Kenlon Road, Tooting, London.

Models and Fittings

Value for Money, there is none better than an "Ejaycee" High Pressure Scale Locomotive. A few of the features which you will find on no other make: Real piston valve cylinders in all gauges, crank shafts turned from the solid, all wheels sprung and equalised, boilers all brazed and made from copper throughout, valve gears correctly designed and set. These combined with perfect scale outline and the finest quality materials and workmanship produce the perfect model. Full catalogue 6d.—"EJAYCEE" MODELS, E. J. COOKE, 66A, George Street, Hastings.

Boilers in Steel or Copper, all types and sizes. Locomotive Boilers from ½″ scale made to fit your frames, flanged plates, supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

Dyak: Frames, 2s.; Buffer Beams, 1s. 2d.; Hornblocks and Axlebores, 3s. 9d. set; Driving, 8d.; Pony, 3d.; Tender, 4½, each wheel; Ponytruck, 1s.; Motion Plates, 1s. 6d.; Pump, Gland, 9d.; Eccentric Straps, 6d.; Gunmetal Cylinders, sets, 11s. pair. Maisie: Frames, 6s.; Beams, 1s. 9d.; Driving, 1s. 6d.; Bogie, 7d.; Trailing, 10d., each wheel; Heavy Hornblocks and Axlebores, 6s. set; Gunmetal Cylinder Castings, 16s.; Cast-iron, 10s. 6d.; Eccentric Straps, 8d.; Double Row Ballraces, 2s. each; Dummy Springs, 1s. 6d., pair; Trailing Tender Hornchecks, 1s. per axle; Axlebores, 8d.; Cuprotectic, 1s. 3d. Postage extra. Boiler materials in last issue.—SUMMERSCALES, Soham, Ely, Cambs.

Model Makers, used to general repair work, track, etc., wanted urgently; preference given to lathe workers.—MULTI-MODELS, LTD., 48, Beak Street, W.1.

The Proof of the Pudding is in the Eating: Look out for our Exhibits at the forthcoming MODEL ENGINEER Exhibition, Stand 39. Builders of High Pressure Steam Locomotives to Scale. Full catalogue, 6d.—EJAYCEE MODELS, E. J. COOKE AND A. J. MOORE, 66a, George Street, Hastings.

For Sale, Stuart Turner two-stroke, 30 c.c., £4 10s.; Lightweight Coil, 10s. 6d.; Flash Steam Boiler, £1; Metre Hydroplane Hull, 15s.—HERON, 17, Emerson Avenue, Middlesbrough.

Unrepeatable ! 2" Gauge L.N.W.R. Precursor, Bassett-Lowke 4—4—0 High Pressure Loco., Careful Owner; complete with approx. 120 ft. Scale Track, Rolling Stock; cost £50; first, £7 15s. Stamp please.—65 Bradford Road, Birkenshaw, Bradford.

Copper Boiler, 12" x 6"; Fittings, £3; Mill Engine, £1; Steam Pump, £1; Grinder, 7s. 6d.—WILLCOX, 48, Wywnstay Gardens, West Hartlepool.

Wanted, complete boiler fittings for small boiler; reasonable.—PUCKEY, 19, Glenmore, Devonport.

Exchange, Brand New Pancotti Piano Accordion, 39 piano keys, 80 base, 3 voice; octave coupler, for Passenger-hauling Coal Fired Loco.—36 Pool Street, Caernarvon.

All Live Steam Requirements at the right price right quality, plus express delivery. Lists free.—EXPRESS LOCO. SUPPLIES CO., 52, Blanmerle Road, New Eltham, S.E.9.

1" Traction Engine Castings, Boiler Material. List, stamp. "M.E. Hexagon" Head Screws and Nuts; sample lot, 1s.—30, Highfield Road, Doncaster.

Enter Your Model in Our Show, August 29th, and help the Hospitals. Two Cash Prizes. Entry Fee, 1s. Models invited for Exhibition only. Entry forms from: OAKES, "Maybrook," Gildersome, Leeds.

Small Locomotives that are also scale models in outside appearance. Gauge "O" to 5" gauge, 1 1/16" to foot. 28 years' practical model loco. experience is behind all locos. I make. Particulars and photo, 2d. stamp.—Below.

Castings and Drawings for 3½" gauge locos., L.M.S. Pacific "The Princess Royal" and S.R. "Eton" 4-4-0 3 cylinder. Photo of L.M.S. and List 2d. stamp.—H. P. JACKSON, 90, Holgate Road, York.

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Buck and Ryan's Lathe Department. Drummonds, Milnes Myford, Exe, Union, Portass, Edgar, Bantam, Boley-Lienen, I.X.L., 5" Leader, Master and many other well-known makers. Send your enquiries to our special Lathe Department M.—310-312, Euston Road, London.

Lathes, Power and Treadle, by all the leading makers in stock. Send your inquiries.—ROSS & ALEXANDER (LONDON), LTD., 165, Bishopsgate, E.C.2.

Milling Attachments, Dividing Heads, Circular Table.—WHEELER CO., LTD., Trench, Wellington, Shropshire.

Wade Lathe Screwcutting Attachment, 15s., post 1s. 3d. extra.—AIRD, Gardner Street, Brighton.

Tools by Easy Payments. Lathes, 25s.; Compound Rests, 15s.; Foot Treadles, 35s.; Saw Benches, Power, £3; Treadle, £6 10s.; Constructor's Saw Fitments, 12s. 6d. Lists, 2d.—BROWN BROS., Accrington.

Eureka Filing Machines as described in March 5th issue of "M.E.," £5 5s. each. Castings, drawings and all material, 21s. other Eureka specialities: Ball bearing H.H.S. Drilling Machine, castings and drawings from 10s. 6d. Rotary Drilling Tables, castings and drawings, 17s. 6d. Bench Power Hack Saw, castings, etc., 25s. Photo of any machine, 3d. each.—POYSER, Peck's Hill, Mansfield.

Myford 3" Lathes. These modern tools of proved design are sturdy and reliable. They are giving good service to the amateur and professional. Your local tool merchant will give you full particulars or write direct to the MYFORD ENGINEERING CO., Neville Works, Beeston, for illustrated booklet and address of nearest agent.

New Bargains. Power Jigsaws, 20s.; ¾" Power Bench Drills, 20s.; 10" Bandsaws, 45s.; 6" Ball Bearing Saw Benches, 30s.—JOHN M. E. STEEL, Bingley.

"Model Engineering." By Henry Greenly, A.I.L.E. With working drawings of Engines, Boilers, Rolling Stock, Cannon, Electric Machines, etc., 85 photographs and 724 line drawings. Price 9s. 3d. post free.—PERCIVAL MARSHALL & CO., LTD., 13-16, Fisher Street, London, W.C.1.

Under Cost, 200 Sets Highest Grade Lathe Tools. List application.—GREENWOOD, Arnside Road, Southport.

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3" S.C. Lathe, complete with tools, countershaft, etc.; also, ¼ h.p. Motor Single Phase; £8 lot, or offer.—17, Nutfield Road, Brentwater Estate, Cricklewood.

Unused Moore and Wright Micrometer, capacity 0-2" by thous.; complete in case, £2. Set M. and W. Stocks and Dies, in case, ⅛"-⅜", with holders bottoming and taper taps; 7 sizes; £1. Motor Countershaft, suitable 3" lathe; £1. 4 inch Independant Chuck, suitable for Myford 3" lathe; 15s.; also Vertical Slide, suitable for same or similar lathe, 15s. "Union" Two Wheel Grinder, complete with two stones, 15s.—Box 1,068, MODEL ENGINEER Offices.

"Modern Engineering Workshop Practice." By H. Thompson, A.M.I.Mech.E. A text-book for the use of engineering students, apprentices and engineers 328 pages; 400 illustrations, 7s. 6d.; post free 8s.—PERCIVAL MARSHALL & CO., LTD., 13-16, Fisher Street, London, W.C.1.

Lathe Driving Wheel, 26" V-belt; 5 speeds; Two Throw Crankshaft; 30s. 26" ditto Wheel, 20s.—JENDEN, 35, Stoneleigh Park, Shirley.

Change Wheels, suitable Drummond Lathes, 10 to set ⅝ bore ⅝ wide, 22s. 6d.; post free.—81, Griffin Road, Plumstead.

Precision Grinding Heads for Lathe; external, 4s. 6d.; internal, 4s. 9d.; post free; stamp, reply.—NORRIS, 173, Park Road, Hockley, Birmingham.

Croft 4½" B.G., S.S., S.C. Gapbed Lathe, 32" between centres, ¾" H.M. Stand, tray; 4½" 3-jaw, 6" 4-jaw, independent ½" drill, chucks, countershaft; ½ h.p. Higgs 250 v. D.C. Motor, Starter; Bariquand Vertical Miller Revolving Table, etc.; Lathe Tools, "Fayette" Castings, Bench Grinder, 6" and 8" wheels; £20, or separate.—BRITAIN, 30, Granville Road, N.12. FIN 0615.

"Modern Workshop Practice." By E. Ernest Pull. A practical text-book for the use of engineers, apprentices and students in technical institutes. 690 pages; 542 illustrations, 16s.; post free 16s. 6d.—PERCIVAL MARSHALL & CO., LTD., 13-16, Fisher Street, London, W.C.1.

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(1) *Every query and Service Enquiry must be accompanied by a coupon from the current issue, and should be addressed "Query Department" or "Service Department,"* THE MODEL ENGINEER, *13-16, Fisher Street, London, W.C.1.*

(2) *Short queries of a general character within the scope of the paper are replied to free of charge provided a stamped addressed envelope is enclosed.*

(3) *Queries of a general character are not replied to by post, except by special arrangement. They will be dealt with in turn either by a short explanatory article in an early issue, or will be published as letters inviting a helpful response from other readers.*

(4) *Where technical information by post is specially desired a charge will be made. The query will be handed over to a selected expert on the subject, who will quote his fee for the service required direct to the querist.* **All queries asking for the winding details for dynamos, motors, and electric apparatus must be accompanied by a fee of 3s. 6d.;** *a similar fee is charged for any subsequent letters of advice required. A stamped addressed envelope must be enclosed in all such cases.*

"The Model Engineer"
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To be cut out and enclosed with each Query or Service Enquiry sent in during the week commencing
August 20th, 1936.
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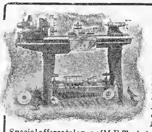

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OF FORTHCOMING EVENTS.

August 22nd—North Staffordshire Models Society. Model Power Boat Regatta at Smith's Pool, Fenton, Stoke, commencing at 3 p.m.

August 23rd—Cup for Autogiro Models. General Competition.

August 23rd—Model Power Boat Association, Farnborough.

September 6th—Cup for Biplane Models. General Competition.

September 17th-26th—"Model Engineer" Exhibition. Royal Horticultural Hall, S.W.1. 11 a.m. to 9.30 p.m. daily.

September 20th — Second Annual Northern Rally of Aeromodellists, Manchester Airport, Barton, at 12 noon.

September 27th—Model Power Boat Association, Victoria Park, London, E. (Grand Regatta).

October 8th, 9th and 10th—Norwich and District Society of Model Engineers. Third annual Exhibition to be held in Norwich.

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